# Emission Reduction Plan for Ports and Goods Movement in California (Approved April 20, 2006)

## TECHNICAL SUPPLEMENT ON EMISSION INVENTORY

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## SUMMARY

This technical supplement to ARB's Proposed Emission Reduction Plan for Ports and Goods Movement provides additional information about how the baseline emissions inventory for ocean-going ships, commercial harbor craft, cargo handling equipment, locomotives, trucks, and transport refrigeration units was developed. The technical supplement is designed to provide the reader with an understanding about how emissions were estimated for each inventory category, and to point the reader to additional reports and documentation sources for further information. As such, this technical supplement is not designed to provide comprehensive documentation for each inventory category. The technical supplement is organized into the following sections:

- Introduction

This technical supplement begins with a brief introduction to emissions inventories and how they are developed and used.

- Summary of Revisions

Between when the draft plan was released in December 2005 and the proposed plan was released in March 2006, Staff made a number of significant revisions to the emissions inventory. This section provides a brief description about each change that was made, and why each change was made.

- Methodologies

This section provides a basic description, by source category, about how emissions were estimated including a list of changes between the December 2005 and March 2006 inventories, emissions summaries, calculation methods, and a list of references for further information.

- Results

This section provides emissions summaries both on statewide and regional levels.

- Peer Review and Response to Comments

When the draft plan was released in December 2005, ARB's emissions inventory was submitted for peer review to Dr. Robert Harley of the University of California at Berkeley, and Dr. James Corbett of the University of Delaware. Both are nationally known experts in emissions inventory development. Their comments and ARB's responses to those comments are provided in this section. In many cases, we revised our approach or presentation of emissions in response to their suggestions.

- References

## INTRODUCTION

An emissions inventory is a database that characterizes and quantifies emissions from sources. Emissions inventories are a critical tool for air quality assessment, because they allow us to compare air pollution impacts of multiple sources, quantify emission reductions, and evaluate progress towards meeting air quality goals. Emissions are estimated by relating a measure of activity, such as how much a vehicle or equipment is used in terms of hours or miles traveled to a measure of how much pollutant emissions are generated per unit activity.

The first step in developing an emissions inventory is to identify the sources which are to be included. For the Proposed Ports and Goods Movement Emissions Reduction Plan, we chose to include the following source categories because they either generate emissions at ports, or are engaged in domestic or international goods movement:

- Ocean-Going Ships (OGV)
- Commercial Harbor Craft (CHC)
- Cargo Handling Equipment (CHE)
- Heavy Duty Trucks (HDT)
- Locomotives (RAIL)
- Transport Refrigeration Units (TRU)

The second step in developing an inventory is choosing which years and pollutants to include. This inventory includes emissions in each category for the years 1998, 2000, 2001, 2002, 2005, 2010, 2015, and 2020. The following pollutants are provided: reactive organic gases (ROG), oxides of nitrogen (NOX), oxides of sulfur (SOX), and particulate from diesel-fueled internal combustion engines (diesel PM).

## SUMMARY OF REVISIONS

This section provides a brief overview of what changes have been made since the release of the December 2005 plan and how these changes affect the inventory. More details about the changes and their effects in each category are described later in the Supplement. Changes here are described by source category:

- Changes Affecting All Categories:

  - This plan now considers the movement of international and domestic goods by trucks and trains. The draft plan released in December included only emissions associated with international goods movement. This plan considers the movement of both domestic and international goods, which leads to an increase in estimated emissions associated with trucks and trains engaged in goods movement.

  - International and domestic growth is explicitly considered for each source category. In the draft plan, growth in the international category was considered independently for each source category. The inventory presented in this plan integrates projected container growth explicitly into growth estimates for every source category, and ensures consistency in international growth assumptions across categories.

- Changes Affecting Ocean-Going Ships

  - Emission factors for propulsion engines engaged in maneuvering the ship within a port were updated based upon new information
  - Auxiliary engine emissions associated with hoteling were revised to correct for a minor calculation error.
  - Emissions associated with external combustion from boilers were added to the inventory.

- Changes Affecting Commercial Harbor Craft

  - The commercial harbor craft inventory was revised to include only those emissions occurring within 24 nautical miles of shore. This change was made to be consistent with the ocean-going vessel inventory.

  - Commercial harbor craft estimates now include the impact of engine standards, fleet turnover, and engine emissions deterioration rates over time. The commercial harbor craft inventory in the draft plan involved a simplified methodology that did not account for changes in emission rates over time, or fleet turnover and penetration of cleaner engines into the fleet. The revised inventory presented in this plan includes these factors.

- Changes Affecting Cargo Handling Equipment

  - No changes were made to the cargo handling equipment inventory.

- Changes Affecting Trucks

  - Truck emissions estimates now include the latest assumptions regarding activity, and emission factors. ARB staff is currently in the process of developing a new version of California's EMFAC model for estimating emissions from motor vehicles. For this project we included some recently available data for the trucks considered in this plan. Incorporating these new data increased the estimated truck emissions and changed the spatial allocation of these emissions within California.

  - The definition of trucks engaged in goods movement was changed. In the Draft December plan, goods a small portion of emissions associated with light-heavy and medium-heavy duty trucks were included as contributing to international goods movement. Based on additional analysis, Staff decided to include only heavy heavy-duty trucks in the goods movement category. This decision was made to reflect the assumption that only the heaviest trucks are able to move large loads and containers.

  - International truck emissions are estimated using an updated methodology. This updated and more accurate methodology is based on estimating VMT associated with international container movements. The approach balances the movement of containers between trains and trucks, and reflects projected growth in container movements over time.

- Changes Affecting Locomotives

  - Staff fundamentally updated the statewide locomotive inventory. This update included estimating a fraction of intermodal trains associated with international goods movement and updating growth assumptions to be consistent with projected growth in container movements over time. This update also included revisions to fuel efficiency estimates that increase our estimates of fuel efficiency gains over time. The combined effect of these changes was a small net increase in future year emissions.

- Changes Affecting Transport Refrigeration Units (TRU)

  - Emissions generated by transport refrigeration units are estimated by the OFFROAD model. Staff updated the OFFROAD model in December and these changes affected TRU estimates.

- Changes Affecting Dredging Equipment

  - ➢ Emissions from dredging equipment were negligible.  Since no emissions reduction strategies were being specifically developed for this category in the Proposed plan, this source category was removed from the inventory.

## GROWTH

Chapter 2 in the Proposed Plan provides a more detailed discussion of growth and its application to the Goods Movement inventories. This section provides additional detail in how growth estimates were derived for individual ports and vessel types.

For simplicity, we have replicated the growth section in Chapter 2 in this document, and added detail where we feel it is appropriate.

Projecting growth in goods movement activities is a key element of the emission inventory development process. Based on recent data, it is clear that California is experiencing a major increase in the amount of goods imported to our ports. Between 2000 and 2004, the number of containers measured as twenty-foot equivalent units (TEU) increased by 40 percent at the Ports of Los Angeles and Long Beach.[1] Between 1990 and 2004, traffic doubled from one to two million TEU per year at the Port of Oakland.[4] The Southern California Association of Governments (SCAG) estimates freight volumes will double or triple in the Los Angeles region over the next two decades[2]. The Bay Area Metropolitan Transportation Commission projects total cargo tonnage will double at the Port of Oakland between 2002 and 2020.[3]

The draft goods movement emission inventory released in December 2005 included growth estimates for international goods movement. With the inclusion of domestic goods movement, we needed to develop estimates of growth for domestic goods separate from the international goods. We also took this opportunity to refine our growth estimates for international goods movement activities. Below, we briefly describe our refinements to the international goods movement growth estimates and our approach for determining the expected growth in domestic goods movement activities.

Staff has revised international goods movement growth estimates by making the growth rates of trucks and trains that transport goods to and from ports consistent with the growth rates applied to ships. These growth estimates are based upon the change in number and capacity of container ships that occurred in the years 1997-2003. Specifically, the change in total installed power of container ships was used to estimate growth.

Installed power is a function of both the number of vessel visits, and the size of propulsion engines installed in each ship. Ultimately installed power is directly related to the weight of cargo moved, and as such is a good surrogate for the change in goods moved by ship over time.

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[1] American Association of Port Authorities (2005). US / Canada Container Traffic in TEUs. Available at: http://www.aapa-ports.org/industryinfo/statistics.htm

[2] Southern California Association of Government (2004), Southern California Regional Strategy for Goods Movement, A Plan for Action. At: http://www.scag.ca.gov/goodsmove/pdf/GoodsmovePaper0305.pdf

[3] San Francisco Bay Conservation and Development Commission and Metropolitan Transportation Commission (2003), San Francisco Bay Area Seaport Plan

The installed power surrogate was developed by Dr. James Corbett of the University of Delaware while under contract to ARB for a study of ocean-going ship emissions. To derive the installed power surrogate, Dr. Corbett evaluated available databases to identify the name of each ship visiting each port in California between the years 1997 and 2003. He then reviewed a database published by Lloyd's of London to identify the size of engines in each ship, to the extent to which data were available. The Lloyds database is a registry, of ship characteristics by ship name.[4] Where ship engine size data was not available, Dr. Corbett developed a regression analysis based on gross ship weight, which was used to estimate installed engine size. Once Dr. Corbett and his staff had developed an estimate for engine size for each ship, they simply added, by year and vessel type or port, the total installed power.

ARB staff, in cooperation with Dr. Corbett, evaluated installed power data from 1997-2003 by vessel type and by port. Staff modeled the data assuming linear growth rates into the future (arithmetic annual growth rate – AAGR), and assuming exponential growth rates into the future (compound annual growth rate – CAGR). Staff then compared future projections based on statistical modeling of the 1997-2003 data and compared those results to other published growth estimates.

Figure 1 compares modeled growth rates in total installed power for all vessel types entering and exiting the ports of Los Angeles and Long Beach. The two gray lines, marked as CAGR and AAGR in the chart legend, reflect the compound and arithmetic growth estimates based upon the installed power surrogate. The blue line, marked as average, reflects the average of the arithmetic and compound growth projections. For comparison purposes, staff normalized growth in container forecasts cited in the Port of Los Angeles No Net Increase report to installed power. Results showed that ARB's average forecast agreed in 2025 with projects developed by the Port of Los Angeles. As a result, staff chose to use growth rates developed by the Port of Los Angeles directly to estimate growth for both the ports of Los Angeles and Long Beach. Staff felt this decision was appropriate because container growth should be somewhat similar between the two ports in the future.

Figure 2 compares the same chart as presented in Figure 1, but for the Port of Oakland. The blue line, marked as average, represents the average of estimated compound and arithmetic growth rates. The average forecast predicts 56% growth by 2010, and 160% growth by 2020 relative to 2002. This forecast was consistent with containerized tonnage forecasts for the Bay Area of 55% by 2010 and 130% by 2020.[5]

In both South Coast and the Bay Area, our forecast based on the average installed power predicted in any given year from compound and arithmetic growth rates agreed well with previously published values.

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[4] Lloyd's Register's Sources Available to Historical Researchers. Available at: http://www.lr.org/services_overview/shipping_information/is010lr_sources.htm

[5] San Francisco Bay Conservation and Development Commission and Metropolitan Transportation Commission (2003), San Francisco Bay Area Seaport Plan

**Figure 1. Modeled Forecasts of Installed Power: South Coast Ports, 1997-2025**

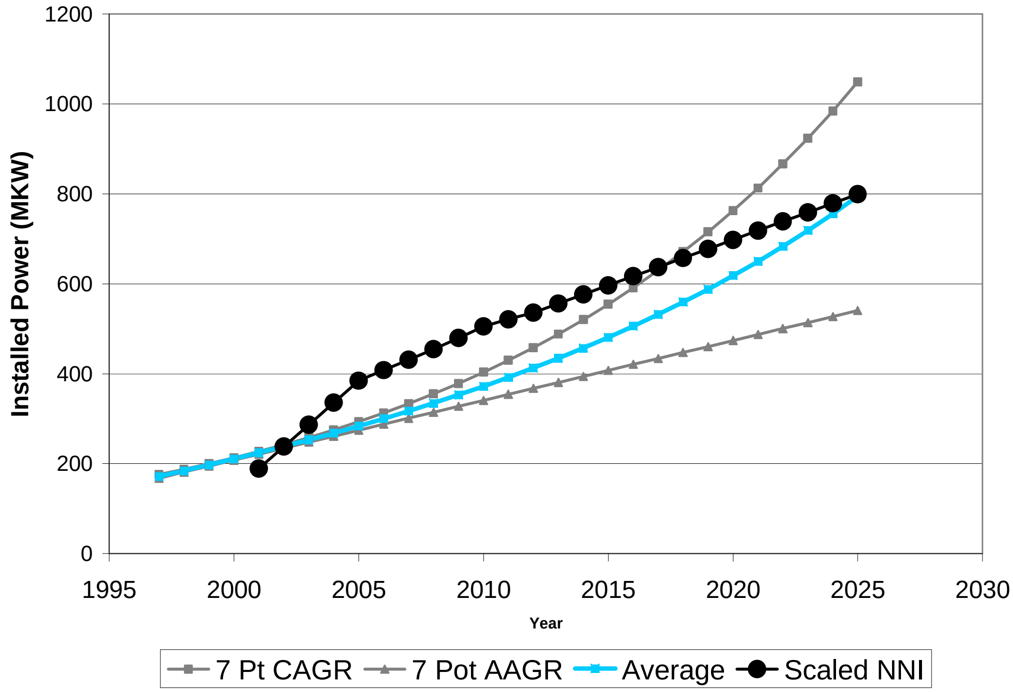
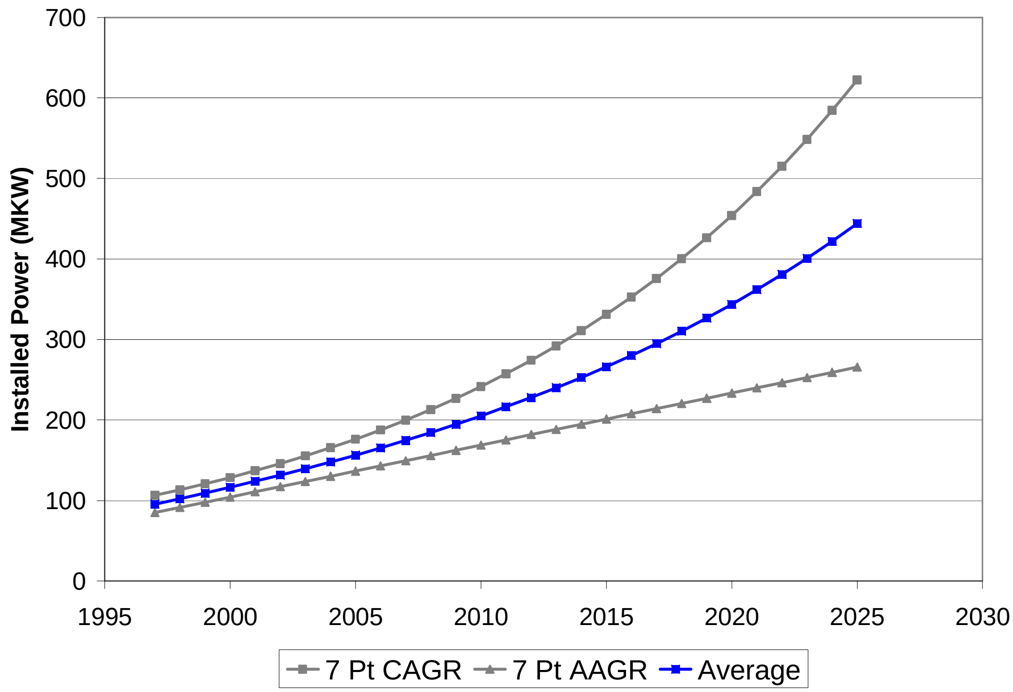
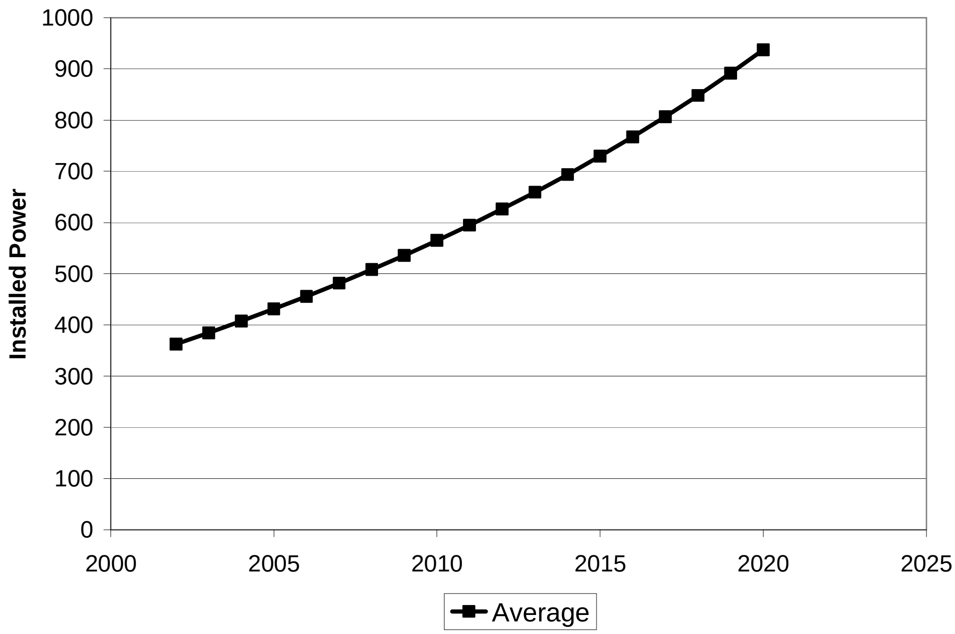



**Figure 2. Modeled Forecasts of Installed Power: Port of Oakland, 1997-2025**



As a result, staff chose to use the average forecast to develop growth rates for each port, and for each vessel type. The projected growth in installed power for container ships, shown in Figure 3, was the growth rate chosen to represent the growth in international intermodal trains, and the growth in the number of containers moved by port trucks over time. This growth could be applied by normalizing projected growth in a given year to a chosen base year.

**Figure 3. Modeled Forecasts of Installed Power: Container Ships Operating off the West Coast of the United States, 1997-2025**




ARB staff are currently working with the University of Delaware, the United States Environmental Protection Agency, and other organizations such as Environment Canada to review ocean-going ship growth rates across the Western Hemisphere. As improved data become available, they will be integrated into growth forecasts and emissions inventories.

## METHODOLOGIES

ARB maintains a comprehensive statewide emissions inventory that is used to assess the relative importance of air pollutant sources, and to gauge the effectiveness of air pollutant emissions reduction and control strategies in air quality plans. Nearly all emissions associated with goods movement are generated by mobile sources. In California, a majority of mobile source inventories are estimated by two mathematical modeling tools: EMFAC for on-road sources such as heavy duty trucks, and OFFROAD for off-road sources such as cargo handling equipment. Emissions for ships, commercial harbor craft, and locomotives are calculated using inventory development methodologies that are similar to but separate from these two models.

Four objectives were defined for developing the goods movement emissions inventory:

- Estimate and compile emissions associated with the goods movement economic sector;
- Compile all emissions associated with California's ports;
- Estimate emissions related to international goods movement; and
- Develop facility-specific emissions estimates for relevant source categories at ports and rail yards in California.

ARB mobile source emissions inventories are typically calculated on a regional level and aggregated by county, air basin, and local air district jurisdiction. These inventories were not designed to estimate the fraction of statewide or regional emissions related to economic sectors such as the movement of domestic and imported/exported goods, and were not designed to provide emissions estimates for specific facilities such as ports or rail yards. In order to meet the objectives discussed above, ARB staff compiled goods movement emissions from several different sources, and did not rely solely upon ARB's statewide and regional emissions inventory estimates. The port and international goods movement inventory subset for some categories (especially trains and trucks) were developed by estimating the fraction of the statewide inventory for these categories that was attributable to international goods movement. Over time, staff expects to integrate much of what has been learned in the process of developing the goods movement inventory into mobile source emissions inventory models.

The goods movement inventory in this report includes emissions generated by ocean-going vessels and commercial harbor craft within 24 nautical miles of shore, cargo handling equipment, trucks, transport refrigeration units, and locomotives.

### A. OCEAN-GOING SHIPS

*Summary of Changes in Ocean-Going Ships Emissions Inventory*

- Main engine maneuvering emission factors adjusted for low speed operations.
- Auxiliary engine emissions associated with hoteling were revised to correct for a minor calculation error.
- Emissions for ship boilers have been added.
- Minor corrections to the length of shipping lanes have been made.

Table 1 provides the effects on the emissions inventory due to these changes.

**Table 1**
**Comparison of Draft December 2005 Ship Emission Estimates with Revised March 2006 Emission Estimates**

| Pollutant | 2001 | | 2020 | |
|---|---|---|---|---|
| | **Draft Goods Movement** December 2005 | **Goods Movement** March 2006 | **Draft Goods Movement** December 2005 | **Goods Movement** March 2006 |
| Diesel PM | 7.8 | 7.8 | 20.7 | 23.3 |
| NOx | 94 | 95 | 223 | 254 |
| SOx | 59 | 59 | 157 | 180 |

*Emissions Inventory Methodology*
Ocean-going ships can be classified into many different categories, including container ships that move goods in containers, tankers that move liquids like oil, roll-on / roll-off vessels that move imported automobiles from Asia, and others. Some vessel types, like container ships, directly move imported goods into the state. Other vessel types, like passenger vessels, are not engaged in goods movement, but do contribute emissions to the overall port-wide total. All types of ocean-going vessels are included in this analysis. This document provides a detailed overview about how emissions for ocean-going ships were estimated. However, complete documentation is available on ARB's internet web site at: http://www.arb.ca.gov/regact/marine2005/appd.pdf.

ARB has developed a regulatory description which defines an ocean-going ship as a vessel greater than or equal to 400 feet in length or 10,000 gross tons; or propelled by a marine compression ignition engine with a displacement of greater than or equal to 30 liters per cylinder. This emissions inventory includes all ship emissions occurring within 24 nautical miles of the California coastline for the goods movement plan. Table 2 provides 2001 emissions estimates, by ship type and pollutant.

**Table 2**
**2001 Ship Emissions Within 24 Nautical Miles from Shore (tons/day)**

| Description | Diesel PM | NOX | ROG | SOX |
|---|---|---|---|---|
| Auto Carriers | 0.4 | 4 | <1 | 3 |
| Bulk Cargo | 0.6 | 8 | <1 | 5 |
| Container | 4.8 | 59 | 2 | 37 |
| General Cargo | 0.3 | 4 | <1 | 2 |
| Passenger | 0.7 | 7 | <1 | 5 |
| Refrigerated Cargo | 0.1 | 1 | <1 | 1 |
| Ro-ro (roll-on, roll-off) | 0.1 | 1 | <1 | <1 |
| Tanker | 0.8 | 10 | <1 | 6 |
| **Total** | **7.8** | **94** | **2** | **59** |

Ship emissions occur during three distinct operating modes: transit (emissions from vessel operations between ports), maneuvering (slow speed vessel operations while in-port areas), and hoteling (also known as berthing; in-port emissions while moored to a dock). Table 3 provides emissions estimates for all ships by operating mode for the year 2001.

**Table 3**
**2001 Ship Emissions by Operating Mode Within 24 Nautical Miles from Shore (tons/day)**

| Description | Diesel PM | NOX | ROG | SOX |
|---|---|---|---|---|
| Hoteling | 1.3 | 15 | <1 | 10 |
| Maneuvering | 0.2 | 2 | <1 | 1 |
| In Transit | 6.4 | 77 | 2 | 48 |
| **Total** | **7.8** | **94** | **2** | **59** |

There are three sources of emissions found on ships: main engines, auxiliary engines, and boilers. The main engine is a very large compression-ignited engine used mainly to propel the vessel at sea. These engines are typically fired by residual oil or bunker fuels, which are essentially low-grade, less-refined diesel fuels with very high sulfur content. Main engines are used during the transit and maneuvering modes. Auxiliary engines are also compression-ignited and generally provide power for uses other than propulsion. Typically, a ship will have a single, large main engine used for propulsion, and several smaller auxiliary engines that operate constantly to provide electricity for ship operations. Cruise ships are an exception to this generalization. These ships have diesel-electric engines, where a large auxiliary engine generates electricity both for ship operations and for powering an electric motor for ship propulsion. In addition to the main and auxiliary engines, most ships have boilers used for fuel and engine heating and for producing hot water. Table 4 provides 2001 ship emissions by engine type.

**Table 4**
**2001 Ship Emissions Within 24 Nautical Miles by Engine Type (tons/day)**

| Description | Diesel PM | NOX | ROG | SOX |
|---|---|---|---|---|
| Auxiliary | 2.1 | 24 | <1 | 16 |
| Main | 5.7 | 70 | 2 | 42 |
| Boiler | <1 | <1 | <1 | 1 |
| **Total** | **7.8** | **94** | **2** | **59** |

The basic equation used for estimating emissions from ocean-going vessels is:

$$E_{y,\,t,\,om,\,e} = \Sigma\ Pop_{t} * EF_{e,\,om,\,f} * Hrs_{om,\,t} * VP_{om,\,t} * \%Load_{om,\,t}$$

where

E = pollutant specific emissions (tons per year of NOx, HC, $CO_2$, $SO_2$, and diesel PM)
Pop = population of ocean-going vessels by vessel type

EF = emission factor by engine type, operating mode, and fuel (units of g / kw-hr)
Hrs = average annual use in hours by operating mode and vessel type
VP = vessel average power by operating mode and vessel type
% Load = average engine load by operating mode and vessel type
y = inventory year
om = operating mode (transit, maneuvering, hoteling)
t = vessel type (auto, container, bulk cargo, etc.)
f = fuel (heavy fuel oil, marine gas oil, or marine diesel oil)
e = engine type

*Population*
2004 California State Lands Commission vessel visits data was used as the primary source of vessel population information. The Lands Commission collects statewide information from the various marine exchanges and port authorities on vessel port visits and vessels transiting along the California coast. The collected vessel data includes vessel identity**,** vessel type, arrival and departure time, port of arrival, last port visited, and next port visited.

ARB staff used this information to determine the number and type of vessels visiting California ports and transiting within the California emissions inventory zone. Overall, more than 99% of all non-tug boat vessel visits recorded in the State Lands' database were counted for the ocean-going ship inventory. Tugboats were included in the commercial harbor craft category.

We believe nearly all vessel transits off the coast of California are included in our ocean-going vessel and commercial harbor craft inventories. Vessels, such as small cargo vessels which may not be captured by the ocean-going ship category are captured under the "other" category of commercial harbor craft. It is possible that we may miss a few ships that travel off of the coast of California but never enter a port in California, however, we believe these omissions are negligible.

*Emission Factors*
The emission factors for both main and auxiliary engines used by ARB staff are generally consistent with the emission factors used by *Starcrest Consulting Group (Starcrest)* in developing the 2001 Port of Los Angeles emissions inventory (Starcrest, 2005). The *Starcrest* emission factors were based on work done by *Entec*. Staff adjusted the emission factors for PM and SOx to reflect the average sulfur content of heavy fuel oil obtained from ARB's 2005 ocean-going vessel survey. ARB staff elected not to use *Starcrest/Entec* emission factors for PM for auxiliary engines using heavy fuel oil. ARB staff also developed an emission factor for CO to supplement the *Entec* emission factors. ARB staff developed an alternative PM emission factor for auxiliary engines using heavy fuel oil. Instead of the *Starcrest/Entec* emission factor for PM of 0.8 g/kW-hr for auxiliary engine using heavy fuel oil, ARB staff used a PM emission factor of 1.5 g/kW-hr. ARB staff believes the *Starcrest/Entec* emission factor was too low based on a re-analysis of available data.

Main engine emission factors for maneuvering have been adjusted, using methodology described in the Starcrest report, for low speeds.  As a result of the revisions, the maneuvering emission factors decreased by about 22% for diesel PM,  9% for SOx and 60% for ROG, The emission factors for NOx more than quadruple for container ships, nearly triple for passenger ships and increased by 63% for tankers.

Emission factors for boilers are fuel-based and were obtained from those used by Starcrest for the Port of Los Angeles emission inventory.

*Activity*
Transit time is estimated by dividing transit length by average vessel speed. The length of the transit (in miles) associated with each vessel trip listed in the Lands Commission data was estimated using US Army Corps of Engineers (USACE) National Waterway Network map data.  Average vessel speeds were obtained from the *Starcrest* report (Starcrest, 2005), which used a proprietary Lloyds of London vessel information database to calculate average vessel speed by vessel type. *Starcrest* also used data from a vessel boarding program that allowed the direct measurement of vessel speeds, as well as other vessel characteristics such as maneuvering time and load factors.

Maneuvering times from the *Starcrest* report were assumed representative for all ports statewide, unless specific information was provided by a port or air district.  The average maneuvering time by vessel type was obtained from the *Starcrest* report. Maneuvering times were determined based upon direct observation in the vessel boarding program. Where available, port specific maneuvering information was incorporated into the inventory.

Average hoteling times were obtained from the 2005 ARB ocean-going vessel survey. For the Ports of LA, Long Beach, Hueneme, and Oakland, vessel specific hoteling times were used.  These hoteling times were obtained from time in port data provided by the port Marine Exchanges.  For LA and Long Beach, the time in port included maneuvering times, so the hoteling times were calculated by subtracting the maneuvering time from the time in port.  For all other ports in California, the average hoteling times were used to calculate emissions.

*Engine Characteristics*
Staff obtained main engine power estimates from the *Starcrest* report, which used a proprietary *Lloyds of London* vessel database to calculate average main engine power by vessel type.  Power estimates of auxiliary engines were obtained from the 2005 ARB ocean-going vessel survey.

The main engine load factor for the transit mode was estimated to be 80%; the main engine load factor during maneuvering was estimated to be 2 percent; and for auxiliary engines the load factors vary depending on vessel type and operating mode.  The auxiliary engine load factor represents the actual engine power used divided by the total installed auxiliary engine power.  All load factors were obtained from the *Starcrest* report and were developed by the Port of Los Angeles.

*Growth*
Future year growth factors were developed based on work done by Dr. James Corbett of the University of Delaware. Dr. Corbett has developed growth factors based on the changes in the installed power of vessels for the years 1997-2003. The growth rates selected are the midpoint between the best fit compounded annual growth rate in vessel power between 1997 through 2003 (upper limit) and the best fit linear (arithmetic) growth rate (lower limit) in vessel power for the same time period. Growth rates were determined by port and by vessel type.

The No Net Increase Task Force developed growth estimates for the Port of Los Angeles from 2001-2025 (NNI, 2005). Reported growth estimates compared well in the year 2025 with growth estimates representing the Ports of Los Angeles and Long Beach developed by ARB staff. Because of this agreement and the extensive work that is detailed in the No Net Increase report, ARB staff adopted growth rates developed by the No Net Increase Task Force for both the Ports of Los Angeles and Long Beach.

Staff also compared ARB-estimated growth rates representing the Port of Oakland with cargo growth estimates detailed in the San Francisco Bay Area Seaport Plan (2003). ARB-developed growth estimates agreed well with projections developed for that report. Port and air basin specific growth rates were used to estimate future year emissions for hoteling and maneuvering emissions. Growth rates for specific vessel types were used to estimate future in-transit emissions.

## B. COMMERCIAL HARBOR CRAFT

*Summary of Changes in Commercial Harbor Craft Emissions Inventory*

- The commercial harbor craft inventory was revised to include only those emissions occurring within 24 nautical miles of shore. This change was made to be consistent with the ocean-going vessel inventory.
- Commercial harbor craft estimates now include the impact of engine standards, fleet turnover, and engine emissions deterioration rates over time. The commercial harbor craft inventory in the draft plan involved a simplified methodology that did not account for changes in emission rates over time, or fleet turnover and penetration of cleaner engines into the fleet. The revised inventory presented in this plan includes these factors.

Table 5 compares the December 2005 emissions inventory and the current inventory for commercial harbor craft.

**Table 5**
**Comparison of Draft December 2005 Commercial Harbor Craft Emission Estimates with Revised March 2006 Emission Estimates**

| **Pollutant** | **2001** | | **2020** | |
|---|---|---|---|---|
| | **Draft Goods Movement** December 2005 | **Goods Movement** March 2006 | **Draft Goods Movement** December 2005 | **Goods Movement** March 2006 |
| Diesel PM | 4.2 | 3.7 | 3.9 | 1.9 |
| NOx | 86 | 75 | 83 | 39 |

*Emissions Inventory Methodology*
Commercial harbor craft are vessels used for commercial purposes or to support public services. This category covers a variety of different types of harbor craft including crew and supply boats, charter fishing vessels, commercial fishing vessels, ferry or excursion vessels, pilot vessels, towboat or push boats, tug boats and work boats. These vessels generally operate within California coastal waters and inland waterways. While they have a home port located in California, some vessels may reside for a period of time outside of California. For the purposes of this inventory, commercial harbor craft do not include recreational vessels used for personal pleasure or the larger ocean-going vessels generally used to transport cargo. This inventory includes harbor craft emissions generated within 24 nm of shore.

This document provides a detailed overview about how emissions for commercial harbor craft were estimated. However, additional documentation is available on ARB's web site at: http://www.arb.ca.gov/msprog/offroad/marinevess/documents/method073004.pdf. In addition, ARB staff are currently in the process of developing a more comprehensive statewide harbor craft inventory which should be completed by the end of this year. Table 6 provides estimated emissions for this category.

**Table 6**
**2001 Commercial Harbor Craft Emissions (tons/day)**

| Description | Diesel PM | NOX | ROG | SOX |
|---|---|---|---|---|
| Charter Fishing | 0.4 | 8 | 1 | <1 |
| Commercial Fishing | 0.6 | 11 | 1 | <1 |
| Crew and Supply | 0.1 | 2 | <1 | <1 |
| Ferry/Excursion | 1.6 | 35 | 3 | <1 |
| Others | <0.1 | 1 | <1 | <1 |
| Pilot | <0.1 | 1 | <1 | <1 |
| Tow Boats | 0.1 | 3 | <1 | <1 |
| Tug Boats | 0.8 | 15 | 2 | <1 |
| Work Boats | <0.1 | 0 | <1 | <1 |
| **Total** | **3.7** | **75** | **8** | **<1** |

The basic equation for estimating emissions from commercial harbor craft is:

$$P_{t,i,y} = \Sigma \, Pop_{t,i,v} * Eng_{t,i} * HP * \%Load * EF_{i,v} * Hrs_{i,v}$$

where

P = pollutant emissions (HC, CO, $NO_x$, PM, and $CO_2$)
Pop = vessel population
Eng = average number of engines per vessel
HP = engine rated brake horsepower
% Load = average engine load
EF = emission factor
Hrs = annual use (actual hours)
y = inventory year
t = vessel type (fishing, tug, etc)
i = engine type (auxiliary or propulsion)
v = engine age (based on model year)

*Population*
The United States Coast Guard (USCG) administers a vessel registration program which was used to developed this inventory.  The Coast Guard provided data for the years 1985 through June 2001.  ARB staff sorted the data by state and removed all non-California documented vessels.  The majority of the vessels that are California vessels fell into one of five categories of vessels: fishing, offshore supply, passenger, tow/tugboats, and unclassified.  The USCG data was supplemented with data from three other sources: a California Fish & Game registry of fishing vessels and vessel operators; an ARB Statewide Commercial Harbor Craft Survey, and data from the Port of Los Angeles on commercial fishing vessels operating out of that port.

*Engine Characteristics*
Data collected in the ARB's Statewide Commercial Harbor Craft Survey was used to develop individual engine profiles for each of the engines reported as a part of the Survey.  Data collected included detailed vessel information including the vessel's home port, vessel use, age, and annual fuel use, percent of hours operated at various distances off the California coast, number of engines, engine make and model, engine age, engine horsepower, and engine annual hours of operation.

The primary source of marine engine load factors was the U.S. EPA's NONROAD model.  Using this model, a load factor value of 43% was assigned to all harbor craft vessel and engine types with the exception of tugboat engines.  A load factor value of 31% for assist tugs is based on the "Harbor Craft" element of the Port of Los Angeles' emission inventory report and was developed by the Starcrest Consulting Group, LLC.

Based on ARB's Statewide Commercial Harbor Craft Survey, half of the marine engines remain after 15 years of use.  Staff assumed 15 years of useful life for the marine engines and applied the S-shape deterioration curve with the 15-year useful life to calculate attrition rates.  Replacement engines follow the Tier Zero engine standards for 1996 through 2003 or EPA Tier II engine standards for 2004 and beyond.

*Emission Factors*
ARB staff used the OFFROAD Model to develop emission factors for the commercial harbor craft category.  Several adjustments were made based upon data representing commercial harbor craft:

- for 1996 through 2003 model year engines, use Tier Zero (1996) emission factors;
- for 2004 and beyond model year engines, use the U.S. EPA emission standards for marine engines (as applicable), and
- adjust the OFFROAD Model emission factors to reflect an "E3" test cycle for propulsion engines and D2 for auxiliary engines.
- The effects of engine deterioration were included in commercial harbor craft emissions.  An S-shaped deterioration curve was assumed for engine population, and it was assumed that engines deteriorated until the useful life of the vessel was reached, at which point no further deterioration was assumed.  This resulted in net increase of commercial harbor craft emissions from five to 40 percent, depending on the type of vessel, the pollutant, and the year of emissions estimate.

*Growth*
Growth in harbor craft emissions was assessed by vessel category. For tug boats, staff assumed emissions growth was consistent with growth in vessel visits, which is essentially flat. No growth was assumed in other harbor craft ship types unless specific information was provided by local air district staff. In 2010, ARB's commercial harbor craft will be required to burn CARB diesel fuel, which will result in a reduction in emissions over time. Additionally, US EPA engine standards went into effect in 2004; these standards limit NOx emissions and limit fuel sulfur.

## C. CARGO HANDLING EQUIPMENT

There was no change in the cargo handling equipment emissions inventory between December 2005 and March 2006.

Cargo handling equipments operate at California's ports and rail yards. They are used primarily to move cargo, but are also used to support the handling of cargo through maintenance activities. This category includes specific container handling equipment such as top and side loaders, as well as more generalized forklifts, cranes, sweeper/scrubbers, bulk handling equipment, and other maintenance equipment. There are approximately 3,700 pieces of cargo handling equipment vehicles at California's ports and intermodal rail yards.

This document provides a detailed overview about how emissions for cargo handling equipment were estimated. However, complete documentation is available on ARB's web site at: http://www.arb.ca.gov/regact/cargo2005/appb.pdf. Table 7 shows the emissions for the various types of cargo handling equipment.

| Table 7 | | | | |
|---|---|---|---|---|
| 2001 Cargo Handling Equipment Emissions (tons/day) | | | | |
| **Description** | **Diesel PM** | **NOX** | **ROG** | **SOX** |
| Crane | 0.1 | 2 | <1 | <1 |
| Excavator | <0.1 | <1 | <1 | <1 |
| Forklift | <0.1 | 1 | <1 | <1 |
| Material Handling Equip | 0.1 | 3 | <1 | <1 |
| Other General Industrial Equip | <0.1 | <1 | <1 | <1 |
| Sweeper/Scrubber | <0.1 | <1 | <1 | <1 |
| Tractor/Loader/Backhoe | <0.1 | <1 | <1 | <1 |
| Yard Tractor | 0.6 | 15 | 2 | <1 |
| **Total** | **0.9** | **21** | **3** | **<1** |

The basic equation used for estimating cargo handling equipment emissions is:

$$E_{y,t} = \Sigma \, Pop_{t,v,x} * HP * \%Load_{t} * EF_{v,x} * Hrs_{t}$$

where

| | | |
|---|---|---|
| E | = | pollutant specific emissions (tons per year of NOx and diesel PM) |
| Pop | = | cargo handling equipment type-specific population |
| HP | = | engine average rated brake horsepower in a given horsepower range |
| % Load | = | average engine load |
| EF | = | emission factor |
| Hrs | = | average annual use in hours |
| y | = | inventory year |
| t | = | equipment type (cranes, yard trucks, etc) |
| v | = | engine age (based on model year) |
| x | = | horsepower range of the engine |

*Population*

Cargo handling equipment populations were developed using information from the ARB 2004 Cargo Handling Equipment Survey, the 2001 Port of Los Angeles emissions inventory, and the 2002 Port of Long Beach emissions inventory. The ARB Cargo Handling Equipment Survey requested information about the numbers of different types of cargo handling equipment at port terminals, annual use, information about the general equipment operating conditions, and engine information (make and model of the engine, horsepower, annual hours of use, any associated control equipment, etc.). The ARB Survey also requested information on associated estimated growth in the population of equipment and hours of operation in 2010 and 2020. Because the Ports of Los Angeles and Long Beach had recently conducted a similar survey, the terminal operators at those two ports were only requested to respond to the survey questions on anticipated growth and the types of installed controls.

*Engine Characteristics*

The ARB Cargo Handling Equipment Survey and the cargo handling equipment emissions inventory data for the ports of Los Angeles and Long Beach were used to estimate average horsepower for various engine horsepower. Load factors for cargo handling equipment were taken from ARB's OFFROAD model for the specific type of cargo handling equipment or similar equipment.

*Emission Factors*

The emission factors used were weighted averages based on the product of the numbers of off-road, on-road, and retrofitted engines in the statewide cargo handling equipment population and the emission factors associated with those engines. The emission factors for off-road engines are taken from ARB's OFFROAD model. Emission factors for on-road engines were taken from the ARB's on-road engine certification standards. The emission factors for retrofitted equipment were developed using OFFROAD emission factors with the control device-specific control efficiencies applied.

As an engine ages, the pollutant-specific emission factors slowly increase. This phenomenon is described as "deterioration" and is primarily due to the wear on the various parts of an engine with use. Modifications were made to the default OFFROAD model deterioration rates to reflect the specific operation of cargo handling equipment. The deterioration rates used were based upon the average useful life for each type of cargo handling equipment obtained from the ARB Cargo Handling Equipment Survey.

*Activity*
The ARB Survey and the information provided by the Ports of Los Angeles and Long Beach provided engine-specific annual use values (hours of operation). It was assumed that all of an engine's hours of operation occurred within the borders of California. The annual use values were used to estimate cumulative engine use. Cumulative engine use is estimated by multiplying the annual use by the age of the engine. The estimate of cumulative engine use is the basis for estimating the impacts of engine deterioration on emissions from individual engines.

*Growth and Control*
Growth factors were based on growth estimates provided by terminal owner/operators as a part of the ARB's 2004 Cargo Handling Equipment Survey. In this survey, the terminal owner/operators provided estimates of the number of pieces of equipment which they anticipated would be used in 2010 and 2020. In addition, the terminal owner/operators were asked to provide estimates of the percent of growth in activity of their equipment in 2010 and 2020. ARB staff used these estimates to develop statewide growth estimates for both equipment populations and equipment activity using weighted averages of the estimated growth over two time intervals, 2004 – 2010 and 2010 – 2020. The estimated growth rates in cargo handling equipment populations and activity varied by equipment type.

Several regulations currently apply to cargo handling equipment, including federal engine emission standards, and ARB fuel requirements. Control factors for these programs are integrated into the existing inventory presented here. Emissions in this category are decreasing with time due to ongoing regulation.

*International and Import – Export Allocation*
ARB staff assumed all cargo handling equipment at ports were related to either the import or export of goods. Splitting emissions into imports and exports was accomplished using port-specific import/export splits that were assumed in the ocean-going ship inventory for each port. Rail yard-specific information provided by Class I rail companies and estimated air basin-specific import/export splits were used to estimate the fractions related to import and export of goods for each rail yard,

## D. LOCOMOTIVES

*Summary of Revisions in Locomotive Emissions Inventory*

- In addition to considering international goods movement in the December 2005 draft plan, the current plan includes the emissions from the movement of domestic goods.
- The current inventory integrates projected container growth into the international intermodal train category.

- The current inventory includes revised assumptions regarding fuel efficiency gains over time.
- The current inventory includes an improved assessment of the impact of 1998 South Coast MOU in terms of emissions reductions achieved in the San Joaquin Valley and other regions in California.

As shown in Table 8 these revisions have substantially changed the emission estimates from previous estimates, primarily as a result of the inclusion of domestic goods movement.

**Table 8**
**Comparison of Draft December 2005 Locomotives Emission Estimates with Revised March 2006 Emission Estimates**

| **Pollutant** | **2001** | | **2020** | |
|---|---|---|---|---|
| | **Draft Goods Movement** December 2005 | **Goods Movement** March 2006 | **Draft Goods Movement** December 2005 | **Goods Movement** March 2006 |
| Diesel PM | 2 | 4.7 | 1 | 4.4 |
| NOx | 77 | 203 | 45 | 139 |

*Emissions Inventory Methodology*
Trains, and the diesel-fueled locomotives that power them, travel throughout California. The vast majority of trains in California move freight; a fraction of this freight represents goods which are imported into and through California from overseas or exported through California to overseas, while the balance represents freight generated in California that is generated and consumed within California or shipped from California to other locations in North America.

This inventory consists of three parts: emissions from trains engaged in all goods movement, emissions associated with the movement of internationally imported and exported goods, and facility-specific emissions from trains operating in ports and rail yards. Table 9 shows total locomotive emissions in California.

**Table 9.**
**2001 Goods Movement Locomotive Emissions (tons per day)**

| **Description** | **Diesel PM** | **NOx** | **ROG** | **SOx** |
|---|---|---|---|---|
| Line Haul | 4.5 | 193 | 12 | 8 |
| Switching | 0.2 | 11 | <1 | <1 |
| **Total** | **4.7** | **204** | **12** | **8** |

*Estimating Emissions Associated with Domestic and International Goods Movement*
The current ARB inventory for trains is based upon an ARB-funded 1991 Booz, Allen, and Hamilton (BAH) locomotive emissions inventory study. This inventory was based on the 1987 base year. Since that time ARB staff has updated the inventory with revised activity, emission factor, growth, and control data. This inventory served as the fundamental basis for the locomotive inventory representing goods movement. For additional information, see the Booz, Allen and Hamilton report on the internet at ftp://ftp.arb.ca.gov/carbis/reports/l343.pdf.

The BAH report provided emissions for the following train categories:

- Line haul: Intermodal locomotives, which generally incorporate modern high-speed engines, and operate at higher speeds and powers than other freight locomotives;
- Mixed/bulk: The most common type of train that transports mixed and bulk goods in short and line-haul duties, and operate at a wide range of power and speeds;
- Local-short haul: Local-short haul locomotives perform a mixture of freight and yard services. They are generally lower power, older engines.
- Yard/switcher: Switching locomotives operate within rail yards; they are characterized by stop and start type movements. They have relatively older, smaller engines.
- Passenger: Passenger locomotives are high speed line haul operations such as AMTRAK.

The inventory uses a relatively simple methodology that accounts for generalized locomotive activity patterns over broad geographical regions. Emissions are calculated using a three step process. First, the average engine emission factor for each locomotive service type is calculated. This is done by weighting available emissions data by locomotive type used for each type of service. Next, a locomotive engine throttle position profile is developed for each type of service. Throttle notches are somewhat analogous to gears for an automobile engine. This estimate reflects the time spent in each throttle notch for each region and each service type calculated in the inventory. Finally, throttle specific emission factors by service type are multiplied by time-in-mode throttle notch data by region and service type to estimate emissions by region and for the state.

*Growth*

To integrate container growth into locomotives growth estimates, ARB staff separated the intermodal train class into two groups: international and domestic. The international portion of intermodal are involved in international goods movement, and the traffic growth of these intermodal locomotives is assumed to be consistent with growth in container ship installed power. The remaining intermodal locomotives move domestic goods and grow at a slower rate consistent with domestic cargo trains.

Based on rail yard specific international/domestic container splits and traffic information at major rail yards provided by Class I rail companies, ARB staff estimated the international portion of intermodal traffic for each air basin in 1987, the inventory base year. Staff estimated 79% of intermodal traffic in the Bay Area and it adjacent coastal areas, and 40% of intermodal traffic in the San Joaquin Valley in 1987 were related to international goods movement. For other air basins, staff estimated about 50 to 55% of intermodal traffic was internationally related.

To estimate the locomotive emission growth, staff used the currently available locomotive fleet, technology, fuel efficiency and traffic growth information to revise the emission forecasted in the BAH study Supplement. The complete BAH report supplement is available at ftp://ftp.arb.ca.gov/carbis/reports/l338.pdf.

Table 10 provides the revised growth rates by train types. Based on the ton-mile per gallon consumed published by the Association of American Railroads (AAR, 2002), staff estimated the fuel efficiency improvements due to better rail lubrication and aerodynamics as well as advancements in train dispatch and control.

**Table 10. Locomotive Emission Growth**

| **Growth through 1987-2000** | | | | | |
|---|---|---|---|---|---|
| **Train Type** | **Fuel Efficiency** | **Introduction of New Locomotives** | **Traffic Levels** | **Net** | **Annual Growth** |
| Intermodal-International | -24.8% | -3.2% | 110.0% | 82.0% | 4.71% |
| Intermodal-domestic | -24.8% | -3.2% | 50.0% | 22.0% | 1.54% |
| Mixed & Bulk | -24.8% | -3.2% | 50.0% | 22.0% | 1.54% |
| Local | -2.4% | 0.0% | -2.0% | -4.4% | -0.35% |
| Yard | 0.0% | 0.0% | -25.0% | -25.0% | -2.19% |
| Passenger | -5.6% | 0.0% | 10.0% | 4.4% | 0.33% |
| **Growth 2001 through 2010** | | | | | |
| **Train Type** | **Fuel Efficiency - Rail Lube** | **Fuel Efficiency - Train Controls** | **Traffic Levels** | **Net** | **Annual Growth** |
| Intermodal-International | -4.8% | -4.8% | 77.0% | 67.5% | 5.29% |
| Intermodal-domestic | -4.8% | -4.8% | 22.5% | 13.0% | 1.23% |
| Mixed & Bulk | -4.8% | -4.8% | 22.5% | 13.0% | 1.23% |
| Local | 0.0% | 0.0% | -10.0% | -10.0% | -1.05% |
| Yard | 0.0% | 0.0% | -15.0% | -15.0% | -1.61% |
| Passenger | 0.0% | 0.0% | 15.0% | 15.0% | 1.41% |
| **Growth 2011 through 2020** | | | | | |
| **Train Type** | **Fuel Efficiency - Rail Lube** | **Fuel Efficiency - Train Controls** | **Traffic Levels** | **Net** | **Annual Growth** |
| Intermodal-International | -4.2% | -4.2% | 67.0% | 58.7% | 4.73% |
| Intermodal-domestic | -4.2% | -4.2% | 18.0% | 9.7% | 0.93% |
| Mixed & Bulk | -4.2% | -4.2% | 18.0% | 9.7% | 0.93% |
| Local | 0.0% | 0.0% | 0.0% | 0.0% | 0.00% |
| Yard | 0.0% | 0.0% | 0.0% | 0.0% | 0.00% |
| Passenger | 0.0% | 0.0% | 15.0% | 15.0% | 1.41% |

Several regulations currently apply to locomotives, including EPA locomotive emission standard, ARB fuel requirements and the 1998 memorandum of understanding with the railroads that operate in the South Coast Air Basin. Control factors for these programs are integrated into the emission inventory presented here.

*Import/export allocation*

International emissions, including emissions generated by international intermodal trains as well as switching at ports and at rail yards engaged in servicing international intermodal trains, were allocated to import and export categories. ARB staff assumed 30% import/70% export for San Francisco Bay Area, 50% import/50% export for Sacramento Region and San Joaquin Valley, 100% export for North Coast region and 75% import/25% export for all other regions.

*Estimating Emissions at Rail Yards and Ports*

ARB staff estimated facility-specific emissions for major ports and rail yards in California. To estimate emissions from ports, staff used locomotive emissions estimates developed by the Ports of Los Angeles and Long Beach, and scaled these emissions to develop estimates for other ports based on port-specific non-petroleum related freight throughput tonnage.

To estimate emissions from off-port rail yards, staff used locomotive emissions estimates for the Roseville Rail yard that were developed previously by ARB (ARB, 2005), and scaled these emissions to develop estimates for other rail yards based on staff's best estimate of the number of locomotives and railcars passing through each rail yard on an annual basis. Facility emissions were deducted from the county emissions in the original statewide inventory to avoid double counting. Because estimates of rail yard activity are based upon confidential data provided by rail operators, they are not presented here. However, emissions can be presented for all ports and rail yards in California, compared to emissions generated by locomotives in transit. These emissions are displayed in Table 11.

**Table 11.**
**2001 Locomotive Emissions by Facility Type and Transit (tons/day)**

| **Location** | **Diesel PM** | **NOX** | **ROG** | **SOX** |
|---|---|---|---|---|
| Transit | 4.1 | 179 | 11 | 8 |
| Ports | 0.1 | 4 | <1 | <1 |
| Rail Yards | 0.5 | 20 | 1 | <1 |
| Total | **4.7** | **203** | **12** | **8** |

These emissions estimates represent the best data currently available to ARB staff. As the state's major rail carriers submit additional data, and as the state's ports begin to generate emissions estimates, facility-specific inventories will improve.

## D. HEAVY-HEAVY DUTY TRUCKS

*Summary of Revisions to Goods Movement Truck Inventory*

- Included emissions from movement of domestic goods;
- Integrated the latest assumptions regarding activity and emission factors;
- Changed definition of the type of trucks engaged in goods movement; and
- Revised approach for estimating port truck and transload truck VMT using container balancing.

More details about the changes in methodologies and their effects are described in the following sections.

*Emissions Inventory Methodology*

Trucks are an important component of California's goods movement transportation system. Nearly all goods moved through California are moved by a truck at some time during their transport. Imported goods enter California through the ports, much of which are packaged in containers. Once at port, containers may be moved by a truck to near- or off-dock rail yards, or to their destination, which is often a distribution center. Heavy-duty trucks engaged in international and domestic goods movement are almost exclusively diesel fueled. Emissions released by these trucks are a substantial component of the total goods movement emission inventory.

The calculation of emissions from trucks is not a simple process. Estimating emissions requires some knowledge about population / engine characteristics, travel activity, and emission factors for individual types of trucks. Engine characteristics include engine model year, manufacturer, and technologies. Travel activity includes not just an assessment of the number of trucks and the distance each truck travels in an area, but also the distribution of speeds at which trucks travel and the number of miles the average truck travels per year. Both fleet characteristics and travel activity are typically provided by local and state governments to ARB.

ARB staff is currently in the process of developing a new version of California's EMFAC model for estimating emissions from mobile sources. For this project we included the most recently available data and latest assumptions used to support on-road emissions inventory development for the trucks considered in this plan. Table 12 shows statewide emissions changes between 2000 and 2020 according to the most recently available data and assumptions regarding Heavy Heavy-Duty Truck (HHDT) VMT redistribution, emission factors, and speed correction factors.

Incorporating these new data and assumptions led to increases in truck emissions as well as changes to the spatial allocation of those emissions throughout California. Table 13 shows the impacts of revised assumptions on the emissions from heavy-heavy duty trucks. As shown in Table 14 these revisions have change the emission estimates substantially from the previous estimates as a result of the inclusion of domestic goods movement and assumption revisions.

| Table 12. | | | |
|---|---|---|---|
| **Statewide Emission Changes between 2000 and 2020 According to the Most Recently Available Data and Assumptions** | | | |
| **Items** | **EMFAC2002** | **Latest Data and Assumption** | **Statewide Emission Changes to EMFAC2002 between 2000 and 2020** |
| HHDT Redistribution | Registration based | Actual travel based | -3% to +4% |
| Emission Factors (EF) | Chassis dyno data for 23 HHDTs (latest model, 1998) | Chassis dyno data for 70 HHDTs (latest model, 2003) | +50% to +200% for $NO_X$<br>-50% to +200% for DPM |
| Speed Correction Factors (SCF) | EPA MOBIL5 Default | Chassis dyno data for 47 HHDTs (latest model, 2003) | -25% to -21% for $NO_X$<br>+28% to +33% for DPM |

| Table 13 | | | | |
|---|---|---|---|---|
| **Comparison of T7 Statewide (international and domestic) Emissions Inventory between EMFAC 2002 and Working Inventory Assumptions** | | | | |
| **Year** | **Diesel PM** | | **NOx** | |
| | **Old T7** | **New T7** | **Old T7** | **New T7** |
| 2005 | 11 | 31 | 517 | 684 |
| 2010 | 9 | 20 | 412 | 553 |
| 2020 | 6 | 6 | 167 | 267 |

*Emissions not adjusted for several regulations that are not included in the working model

| Table 14. | | | | |
|---|---|---|---|---|
| **Comparison of Draft Goods Movement Emission Estimates with Revised Current Emission Estimates for 2001** | | | | |
| **Truck Type** | **Diesel PM** | | **NOx** | |
| | **Draft Goods Movement Dec. 2005** | **Goods Movement March 2006** | **Draft Goods Movement Dec. 2005** | **Goods Movement March 2006** |
| Heavy-Heavy Duty Trucks | 2.0 | 37.7 | 110 | 655 |
| Medium-Heavy Duty Trucks | 0.2 | 0 | 10 | 0 |
| Light-Heavy Duty Trucks | 0.02 | 0 | 5 | 0 |
| **Total** | **2.2** | **37.7** | **125** | **655** |

*Emissions adjusted for several regulations.

*Container Balancing*

Developing an emissions inventory for heavy-duty trucks associated with international goods movement requires a multi-stage process because EMFAC (ARB, 2004), the model used to estimate heavy-duty truck emissions in California, does not estimate heavy-duty truck emissions for an economic sector such as goods movement. Our approach in developing an international goods movement heavy-duty truck inventory is to estimate a portion of emissions in EMFAC associated with international goods movement, and to supplement these data with facility-specific emissions estimates for ports and rail yards in California.

1. South Coast Air Basin (SoCAB)

To estimate import and export related truck emissions on a statewide basis, staff first examined international goods movement related truck VMT at the Ports of Los Angeles (LA) and Long Beach (LB) by counting number of container lifts. The ports of LA/LB provided ARB with the number of container lifts by transportation mode (rail or truck) for import and export (including empty containers), as shown in Table15.

**Table 15.**
**Container Lifts by Transportation Mode for Import and Export (1,000 Lifts/Year)**

| Year | Mode | Import | Export |
|---|---|---|---|
| 2004 | On-Dock Rail | 774 | 543 |
| | Off/Near-Dock Rail | 864 | 676 |
| | Truck | 2,190 | 2,192 |
| 2005 | On-Dock Rail | 882 | 748 |
| | Off/Near-Dock Rail | 852 | 687 |
| | Truck | 2,258 | 2,414 |

Staff also assumed all trucks entering and exiting the ports were Heavy Heavy-Duty Trucks (HHDTs).

Staff next estimated the secondary HHDT trips associated with the Ports. To estimate the secondary HHDT trips, staff used a table developed by the Alameda Corridor Transportation Authority in 2004, which stated that 11% of import HHDT trips leaving the port terminated at local distribution centers where goods were transloaded into other HHDTs, and were destined for intermodal rail facilities (Jones and Stokes, 2004). Staff assumed these trips represented trips to a distribution center, and resulted in additional secondary HHDT trips. For additional secondary HHDT trips, long-haul HHDT trips, associated with the Ports, staff used the same table as above, which stated that 21% of all truck trips leaving the port were destined to be transloaded to another HHDT at distribution centers (Jones and Stokes, 2004). Transloading is the process of repackaging material that comes into a distribution center in a 40-foot container into a larger 53-foot container. This makes long truck-line hauls more efficient. It also reduces the number of line-haul trips, because 53-foot containers are larger than 40-foot containers. Staff assumed that a 40-foot container trip generates a two-third 53-foot container trip.

Staff estimated that 21% of import related truck trips to ports were destined for long-hauls on HHDTs. The Metropolitan Transportation Authority's (MTA) 2004 Freight Compendium was used to apportion these trips to their final destinations within or outside of California (MTA, 2004). Some of these trips terminate in other California Air Basins, Arizona, or Canada. For each of these terminations, a travel distance within the Basin was estimated by geographic information system (GIS) distance analysis, such as 78 miles to the air basin border for trips going to Arizona, or 93 miles for trips traveling north along Interstate 5. The number of trips for each destination was calculated and multiplied by the travel distance to get secondary line-haul VMT. Table 16 provides the fraction of trips and estimated trip length for long-haul HHDT trips with destinations outside of the South Coast Air Basin.

| Table 16. | | |
|---|---|---|
| **Percent of Truck Trips and Estimated Trip Length for Trips Terminating Outside of the South Coast Air Basin** | | |
| **Final Destination** | **Percent of Trips (%)** | **Estimated Trip Length from Ports to SoCAB Border (miles)** |
| Sacramento Region | 3 | 93 |
| San Diego Area | 19 | 57 |
| San Francisco Bay Area | 12 | 93 |
| Mojave Desert Area | 8 | 78 |
| South Central Coast Area | 8 | 62 |
| San Joaquin Valley Area | 8 | 93 |
| Salton Sea Area | 8 | 124 |
| Arizona | 19 | 78 |
| Canada | 6 | 93 |
| Illinois | 6 | 93 |
| Texas | 3 | 124 |

Because containers associated with truck trips were divided by import and export (including empty containers) for the year 2005, staff could estimate 2005 primary port truck VMT and secondary transloaded line-haul truck VMT by import and export in the South Coast Air Basin. Using ocean going vessel (OGV) growth rates from 2000 to 2025, staff calculated primary and secondary HHDT VMT for years 2000, 2005, 2010, and 2025. For operation days per year, staff assumed that HHDTs were operated at the Ports for 260, 310, 310, and 360 days for years 2000, 2005, 2010, and 2025, respectively. Then staff calculated primary and secondary HHDT VMT for years 1998, 2000, 2001, 2002, 2015, and 2020 by interpolation. Then, total HHDT VMT (primary + secondary HHDT VMT) related to international goods movement was divided by the total HHDT VMT in the South Coast Air Basin to calculate international goods movement related HHDT VMT fractions. Staff obtained the total HHDT VMT from the EMFAC2007 draft working model for the South Coast Air Basin. International goods movement related to HHDT VMT fractions are shown in Table 17. VMT fractions in Table 17 includes VMT fractions originated from the San Francisco Bay Area.

| Table 17. | | | |
|---|---|---|---|
| **Heavy Heavy-Duty Truck VMT Fractions Associated with International Goods Movement in the South Coast Air Basin** | | | |
| **Year** | **Import** | **Export** | **Total** |
| 2001 | 0.061 | 0.051 | 0.112 |
| 2005 | 0.059 | 0.049 | 0.108 |
| 2010 | 0.057 | 0.047 | 0.104 |
| 2015 | 0.069 | 0.056 | 0.125 |
| 2020 | 0.081 | 0.066 | 0.147 |
| 2025 | 0.092 | 0.076 | 0.168 |

To calculate HHDT emissions in the South Coast Air Basin, staff developed emissions scalars for each primary and secondary HHDTs, developed using HHDT age distributions of port trucks and long-haul HHDTs for the primary and secondary HHDT trips, respectively. For the port truck age distribution, staff used truck age distributions reported by Starcrest Consulting Group (2005). For the long-haul HHDT age distribution, staff used that HHDT age distribution younger than seven years old because studies showed that long-haul HHDTs were much younger than HHDTs locally operated. By applying the two age distributions, staff calculated two emissions scalars shown in Table 18.

**Table 18**
**2001 Primary and Secondary Heavy Heavy-Duty Truck Emission Scalars in the South Coast Air Basin**

| Pollutant | Primary Scalars | Secondary Scalars |
|---|---|---|
| ROG | 1.24 | 0.57 |
| NOx | 0.97 | 1.01 |
| SOx | 1.00 | 0.99 |
| Diesel PM | 1.51 | 0.39 |

By applying the international goods movement related HHDT VMT fraction, primary and secondary HHDT emissions scalars to the South Coast Air Basin total HHDT emissions, staff calculated international goods movement related HHDT emissions for the South Coast Air Basin. One of the objectives of this inventory effort was not only to provide emissions estimates for counties, but also to provide facility-specific emissions estimates for ports and rail yards in California. To represent emissions at facilities in the South Coast Air Basin, staff used on-terminal and in-port truck emissions estimates provided in the recently completed Ports of Los Angeles and Long Beach emissions inventories. These estimates were used directly for the ports of Los Angeles and Long Beach. The ratio of the number of yard hostlers at each rail yard in the Los Angeles region to the total number of yard hostlers at the ports of Los Angeles and Long Beach was used to apportion a fraction of port emissions to each rail yard in the South Coast Air Basin. Table 19 provides HHDT emissions by facility type in the South Coast Air Basin.

**Table 19.**
**2001 Heavy Heavy-Duty Truck Ports and International Related Emissions by Transit or Facility Type in the South Coast Air Basin (tons/day)**

| **Location** | **Diesel PM** | **NOX** | **ROG** | **SOX** |
|---|---|---|---|---|
| Transit | 1.2 | 15 | 1 | <1 |
| Port | 0.1 | 4 | <1 | <1 |
| Rail Yard | <0.1 | 1 | <1 | <1 |
| Total | **1.3** | **20** | **2** | **<1** |

2. San Francisco Bay Area

For the San Francisco Bay Area staff used the same container counting approach as for the South Coast Air Basin. Staff obtained number of containers in Twenty-Foot Equivalent unit (TEU) for import and export (including empty containers) at the Ports of Oakland and San Francisco in 2000 (AAPA, 2005). Staff assumed that the standard length of containers at the Ports was forty feet, so that staff converted the number of containers in TEU into the number of containers in 40-foot unit by apply the conversion factor of 1.8 (AAPA, 2005). Table 20 shows the number of containers by transportation mode for import and export from the Ports of Oakland and San Francisco.

**Table 20.**
**Containers for Import and Export from the Ports of Oakland and San Francisco (1,000 Lifts/Year)**

| Year | Import | Export |
|---|---|---|
| 2000 | 288 | 727 |
| 2005 | 471 | 811 |

Because the number of containers from the Ports was provided by import and export, staff applied freight tonnage flow by transportation mode (truck or rail) and travel direction for import and export to estimate HHDT trips by the mode and direction. The freight tonnage flow data provided the 1996 annual freight flow originated/destined from the San Francisco Bay Area to destined/originated counties by rail and trucks (MTC, 2004). The Metropolitan Transportation Commission (MTC) data showed that HHDTs transported 58% and 66% of goods for import and export, respectively. Table 21 shows the fractions of truck freight flow and travel distance to the Bay Area border, terminating outside of the San Francisco Air Basin. The travel distance (miles) were obtained through GIS spatial distance analysis.

**Table 21.**
**Percent of Heavy Heavy-Duty Truck Trips and Estimated Trip Length for Trips Terminating Outside of the San Francisco Bay Area**

| Final Destination | Percent of Trips (%) | Estimated Trip Length from Ports to Bay Area Border (miles) |
|---|---|---|
| Sacramento Region | 11 | 44 |
| San Joaquin Valley Area | 30 | 65 |
| Mojave Desert Area | 7 | 33 |
| Salton Sea Area | 8 | 33 |
| San Diego Area | 11 | 33 |
| South Coast Area | 18 | 33 |
| North Central Coast Area | 4 | 81 |
| Canada | 1 | 40 |
| Arizona/Texas | 6 | 33 |
| Illinois | 4 | 22 |

To estimate secondary long-haul HHDT trips in the Bay Area, staff assumed that the destinations terminating outside of the Bay Area are associated with the secondary long-haul HHDT trips. Among the destinations out of the Bay Area, staff assumed that HHDTs do not generate the secondary long-haul HHDT trips for Sacramento Region, San Joaquin Valley, and North Central Coast Air Basins because HHDTs terminating those air basins were directly associated with goods movement to/from the Ports. To calculate HHDT VMT associated with international goods movement, staff used the same method as used for the South Coast Air Basin. International goods movement related HHDT VMT fractions in the San Francisco Bay Area are shown in Table 22.

Fractions in Table 22 include HHDT VMT fractions originated from the South Coast Air Basin.

| Table 22. Heavy Heavy-Duty Truck VMT Fractions Associated with International Goods Movement in the San Francisco Air Basin | | | |
|---|---|---|---|
| **Year** | **Import** | **Export** | **Total** |
| 2001 | 0.016 | 0.030 | 0.046 |
| 2005 | 0.018 | 0.033 | 0.051 |
| 2010 | 0.020 | 0.037 | 0.057 |
| 2015 | 0.023 | 0.043 | 0.066 |
| 2020 | 0.027 | 0.049 | 0.076 |
| 2025 | 0.030 | 0.054 | 0.084 |

To calculate HHDT emissions in the Bay Area, staff used emissions scalars for each primary and secondary HHDT, developed for the South Coast Air Basin. By applying the international goods movement related HHDT VMT fractions, primary and secondary emissions scalars to the Bay Area total HHDT emissions, staff calculated Bay Area HHDT emissions related to international goods movement. Staff also used the same method as used for the South Coast Air Basin to calculate facility specific HHDT emissions in the San Francisco Bay Area. Table 23 shows HHDT emissions by facility type in the San Francisco Bay Area.

| Table 23. 2001 Heavy Heavy-Duty Truck Ports and International Related Emissions by Transit or Facility Type in the San Francisco Air Basin (tons/day) | | | | |
|---|---|---|---|---|
| **Location** | **Diesel PM** | **NOX** | **ROG** | **SOX** |
| Transit | 0.2 | 2 | <1 | <1 |
| Port | <0.1 | 1 | <1 | <1 |
| Rail Yard | <0.1 | <1 | <1 | <1 |
| Total | **0.2** | **3** | **<1** | **<1** |

3. Other Regions of California

To estimates the fraction of international goods movement related HHDT emissions for other air basins having ports (including the San Diego, San Joaquin Valley, Sacramento Region, and South Central Coast Air Basins), staff used a similar approach that used for the San Francisco Air Basin by using annual freight tonnage ratios to South Coast Air Basin annual freight tonnage for import and export. Staff assumed that all primary HHDT trips would be terminated within their air basin boundaries. Secondary HHDT VMT for those air basins were originated from the South Coast and San Francisco Air Basins. If air basins (including Mojave Desert, Northeast Plateau, Mountain Counties, Salton Sea, and North Central Coast Air Basins) did not have a port, only secondary HHDT VMT was assumed, which were originated from the South Coast and San Francisco Air Basins. To estimate secondary HHDT VMT for air basins, staff conducted GIS spatial distance analysis and calculate a truck travel distance for air basins. Then, a truck travel distance was multiplied by total number of HHDT trips originated from the South Coast and San Francisco Air Basins to air basins. Table 24 provides calculated international goods movement related HHDT VMT fractions. Table 25 presents HHDT emissions by facility type for air basins other than the South Coast and San Francisco Air Basins.

| Table 24. | |
|---|---|
| **2001 International Goods Movement Related Heavy Heavy-Duty Truck VMT fractions for Air Basins** | |
| **Air Basin** | **2001** |
| San Diego | 1.8% |
| San Joaquin Valley | 2.2% |
| Sacramento Region | 1.6% |
| South Central Coast | 1.0% |
| Mojave Desert | 2.0% |
| Northeast Plateau | 2.1% |
| Mountain Counties | 2.8% |
| Salton Sea | 0.5% |
| North Central Coast | 0.1% |

| Table 25. | | | | |
|---|---|---|---|---|
| **2001 Heavy Heavy-Duty Truck Ports and International Related Emissions by Transit or Facility Type in the Air Basins Outside of South Coast and San Francisco Air Basins(tons/day)** | | | | |
| **Location** | **Diesel PM** | **NOX** | **ROG** | **SOX** |
| Transit | 0.2 | 9 | <1 | <1 |
| Port | <0.1 | <1 | <1 | <1 |
| Rail Yard | <0.1 | <1 | <1 | <1 |
| Total | **0.2** | **9** | **<1** | **<1** |

## F. TRANSPORT REFRIGERATION UNITS

While the December 2005 draft plan only considered emissions from movement of international goods, the current plan included both international and domestic goods movement emissions by transport refrigeration units. Table 26 provides the comparison between the revisions. Emissions for the transport refrigeration units (TRU) are calculated in California using the OFFROAD model and included in the goods movement inventory. ARB staff estimated about 3% of the TRU emissions were associated with international goods movement with the remaining 97% associated with domestic goods movement.

**Table 26**
**Comparison of Draft December 2005 Transport Refrigeration Units Emission Estimates with Revised March 2006 Emission Estimates**

| **Pollutant** | **2001** | | **2020** | |
|---|---|---|---|---|
| | **Draft Goods Movement** December 2005 | **Goods Movement** March, 2006 | **Draft Goods Movement** December 2005 | **Goods Movement** March, 2006 |
| Diesel PM | 0.4 | 2.5 | 0.1 | 0.1 |
| NOx | 4 | 22 | 2 | 28 |

## RESULTS

A. STATEWIDE GOODS MOVEMENT EMISSIONS

Table 27 presents estimated emissions related to goods movement in 2001, the base year for this plan. On a typical day, we estimate more than 1000 tons per day of NOx are emitted from goods movement activities in California, representing about 30% of the total statewide NOx emissions inventory. More than seventy tons per day of SOx were generated by goods movement activities in 2001. Diesel particulate emissions generated by goods movement were estimated to be about 57 tons per day of PM and represented about 75 percent of the statewide diesel particulate inventory.

**Table 27.**
**2001 Statewide Pollutant Emissions from Goods Movement (tons per day)**

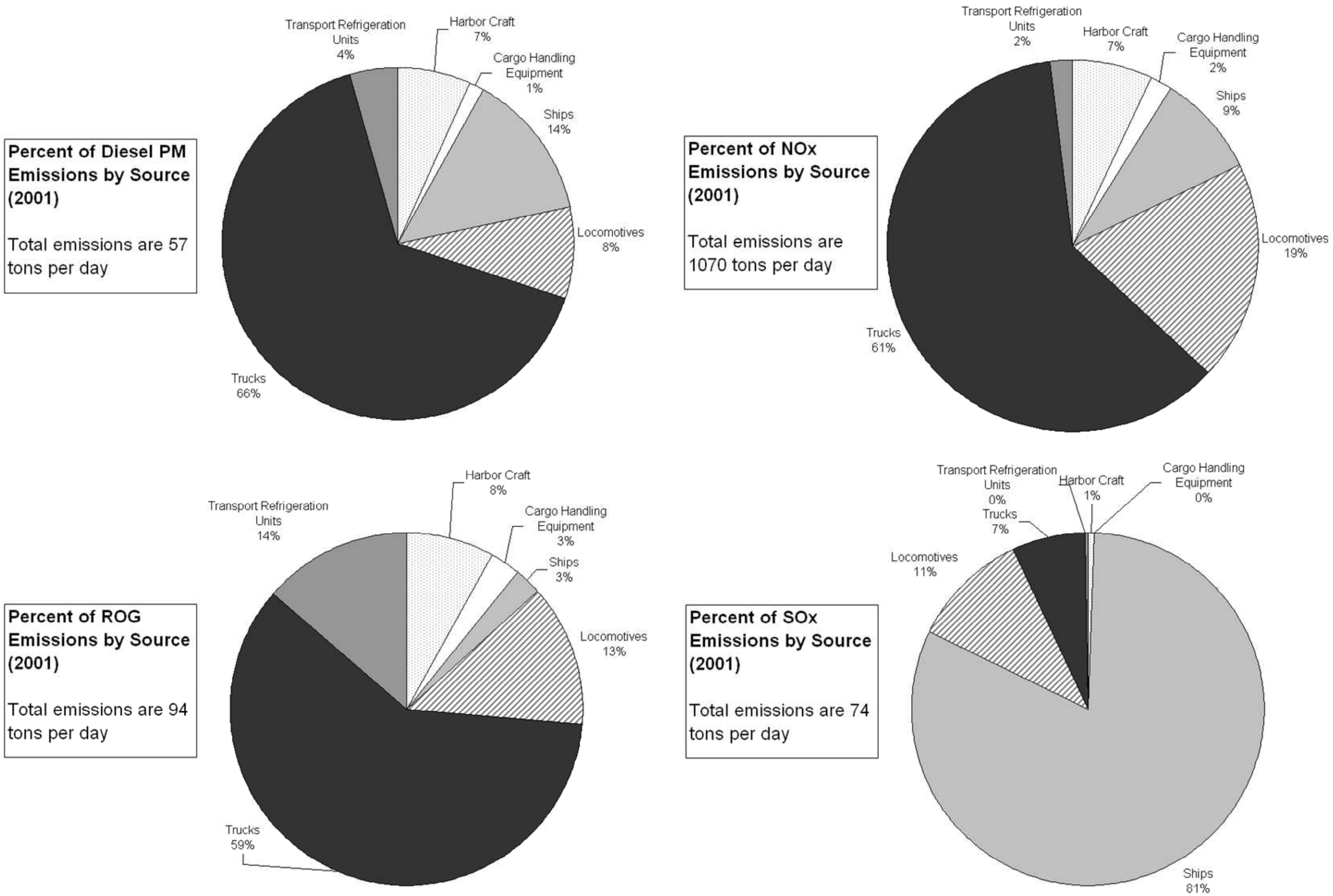
| Pollutant | Ships | Harbor Craft | Cargo Handling Equipment | Trucks and TRU | | Locomotives | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | Domestic | International | Domestic | International | |
| Diesel PM | 7.8 | 3.8 | 0.8 | 38.4 | 1.8 | 3.5 | 1.2 | **57.3** |
| NOx | 95 | 75 | 21 | 644 | 33 | 153 | 50 | **1071** |
| ROG | 2 | 8 | 3 | 66 | 3 | 9 | 3 | **94** |
| SOx | 60 | <1 | <1 | 4 | <1 | 6 | 2 | **74** |

We can understand emissions from goods movement by analyzing the contribution of emissions generated by each stage of the goods movement process. Figure 4 presents a series of pie charts that depict the proportion of each source category's contribution to total goods movement emissions for the 2001 inventory year. Ocean-going ships are the largest contributor of SOx; while trucks are the largest single contributor of diesel PM, ROG and NOx.

ARB estimates growth in each category of the goods movement emissions inventory. Growth estimates are based on expected growth in economic and equipment-specific factors relevant to each source category, which are affected by the expected growth in imported goods. Over the next several decades, the amount of goods imported into or moved through California is projected to increase dramatically. This will result in increased goods movement through all ports in California, but most of this increase is expected to be borne by the ports of Los Angeles, Long Beach, and Oakland. As imports increase, more ships will enter the ports, more cargo handling equipment will move imported goods, and more trucks and trains will transport goods to their final destinations. This growth will have a major impact on southern California and the State as a whole.

Figure 5 provides all goods movement and Figure 6 provides ports and international goods movement emission estimates by pollutant and by year for 2001-2020. While the SOx emissions for all goods movement are projected to almost triple, the emissions for other pollutants are projected to decrease by about 40 percent by 2020. The emissions from ports and international goods movement increase with the dramatic growth in imported goods. By 2020 diesel particulate emissions are projected to double and

**Figure 4. 2001 Statewide Goods Movement Emissions**



SOx emissions are projected to triple.  NOx emissions are projected to increase 40 percent by 2020, primarily in areas that are currently not in attainment with air quality standards.

**Figure 5**
**Statewide All Goods Movement Emissions**

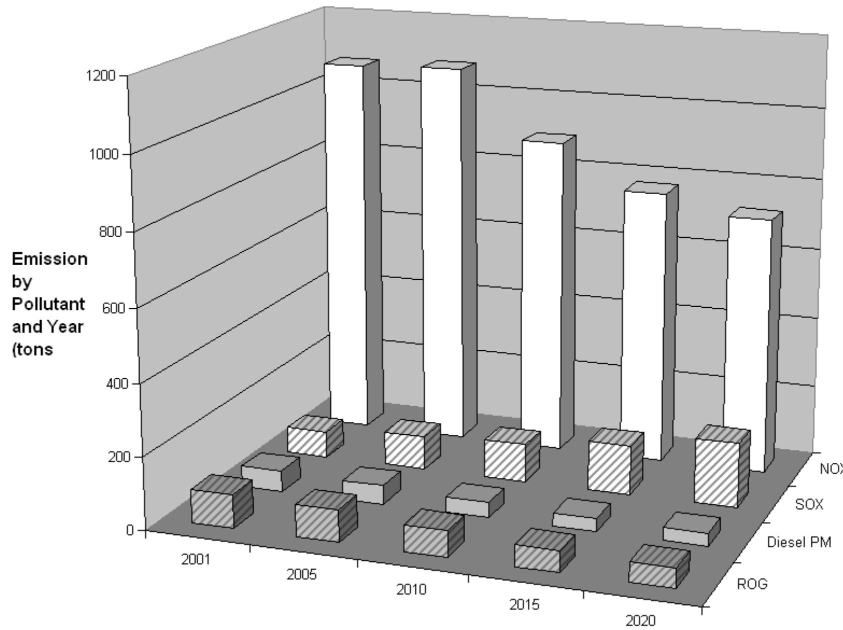
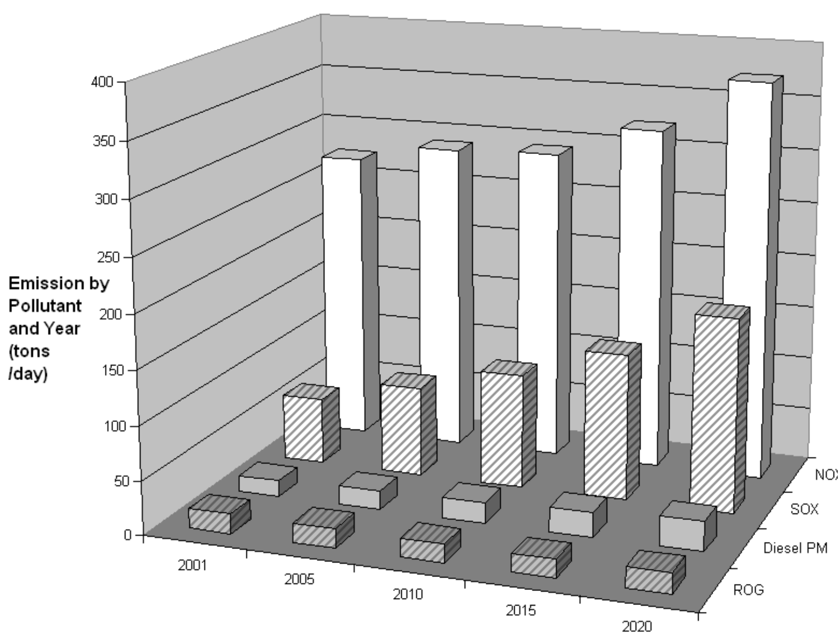
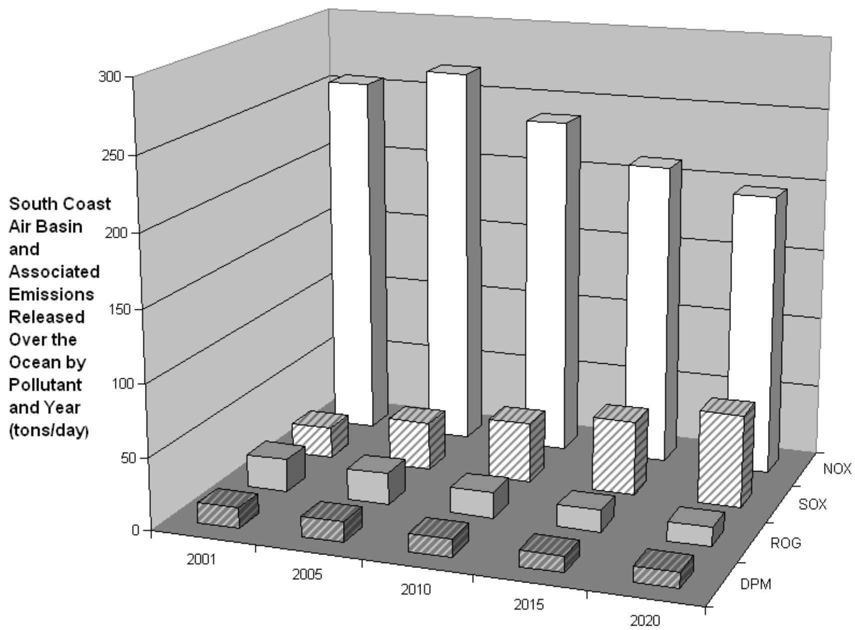



**Figure 6. Statewide Ports and International Goods Movement Emissions**



These trends are also apparent in the greater Los Angeles region. Figure 7 presents emissions in the South Coast Air Basin and emissions released over the ocean up to 24 miles off the coast of Los Angeles and Orange counties. Roughly one-third of all goods movement emissions statewide are generated in the Los Angeles region.

**Figure 7. Goods Movement Emissions in the South Coast Region**




The increasing contribution of ports and international goods movement emissions to the statewide inventory is important. Figure 8 compares goods movement and statewide emissions by pollutant for the years 2001-2020. By 2020, we estimate SOx from goods movement sources will represent nearly 50 percent of the statewide SOx inventory. NOx emissions will grow from 29 percent to 36 percent of the statewide inventory. Impacts will be at least as great in southern California as for the State as a whole given the expected increase in imports through the Ports of Los Angeles and Long Beach. These two ports together are one of the largest and most important ports in the U.S.

As goods movement activity increases with growth in imported goods and our economy as a whole, the relative contribution of different source types to the emissions inventory will change. Figure 9 displays the 2020 emissions inventory by pollutant and source category. Figure 10 compares 2001 and 2020 goods movement emissions by pollutant and source category. Emissions generated by heavy duty trucks, locomotives, and cargo handling equipment are projected to decrease between 2001 and 2020 due to existing control measures that have been adopted for these categories. At the same time, emissions from ocean-going ships are projected to increase substantially. As Figure 9 shows, by 2020 ships and harbor craft will be responsible for at least 70 percent of all diesel particulates and 40 percent of NOx generated by goods movement activities statewide, and nearly all of the SOx.

**Figure 8. Goods Movement Emissions as a Percentage of Statewide Emissions**

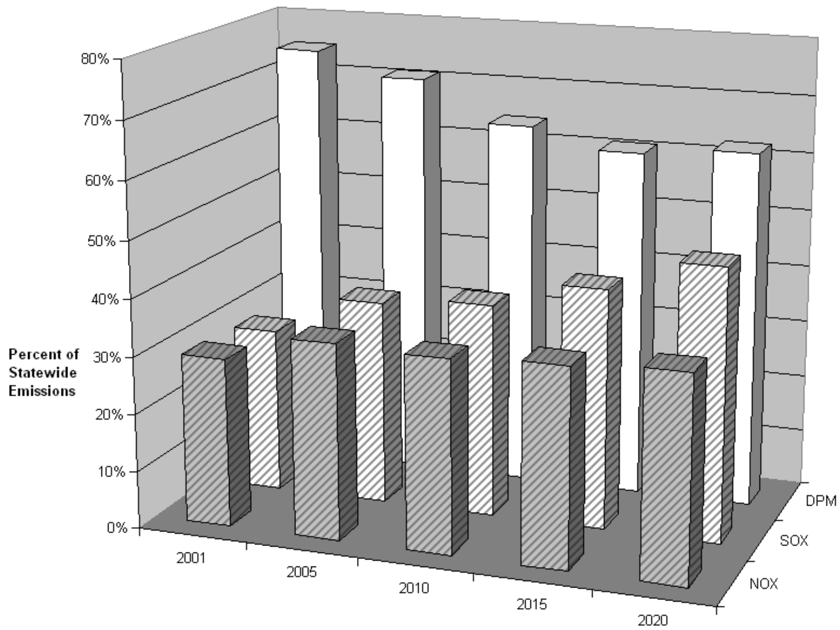


**Figure 9. 2020 Statewide Goods Movement Emissions**

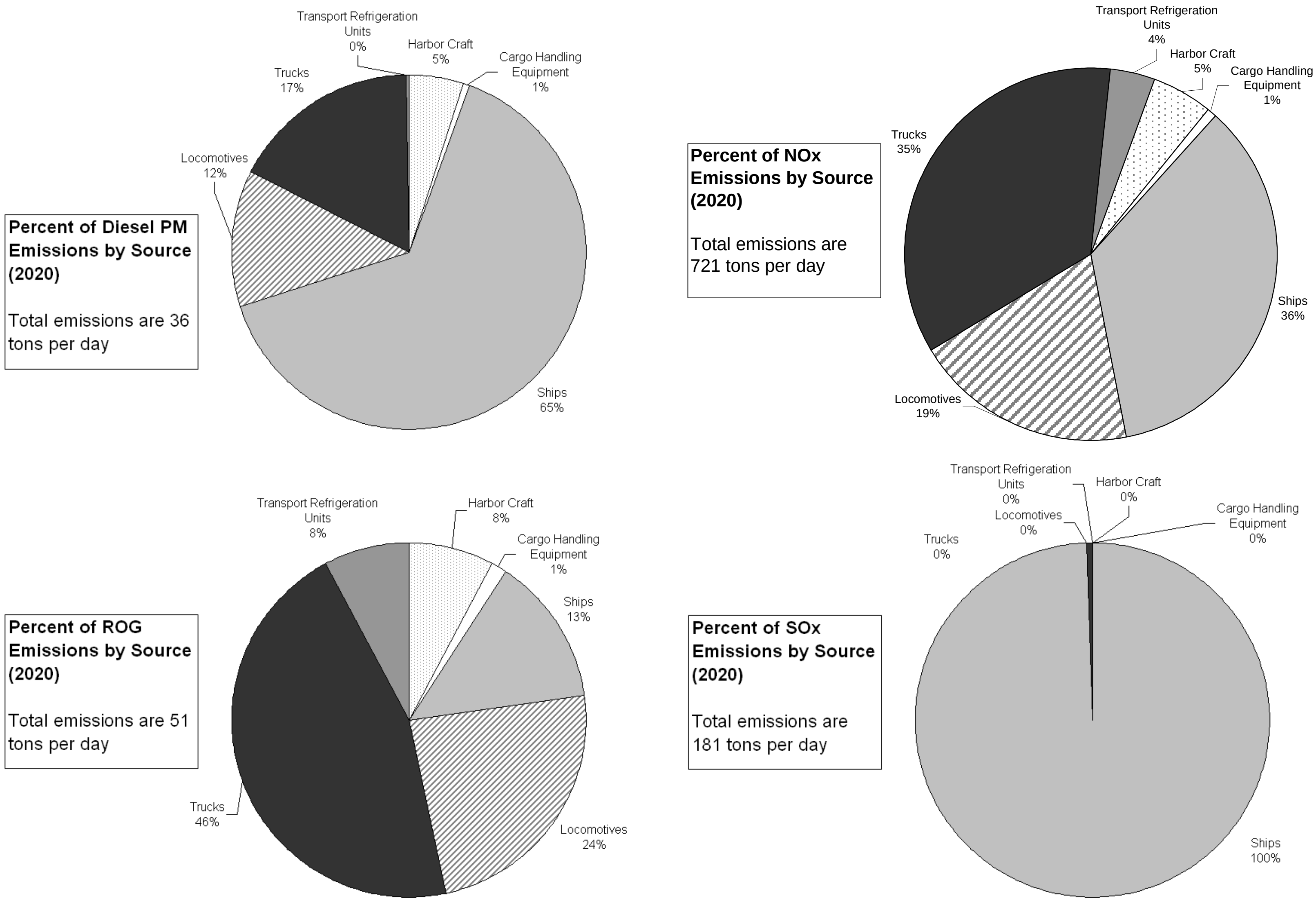
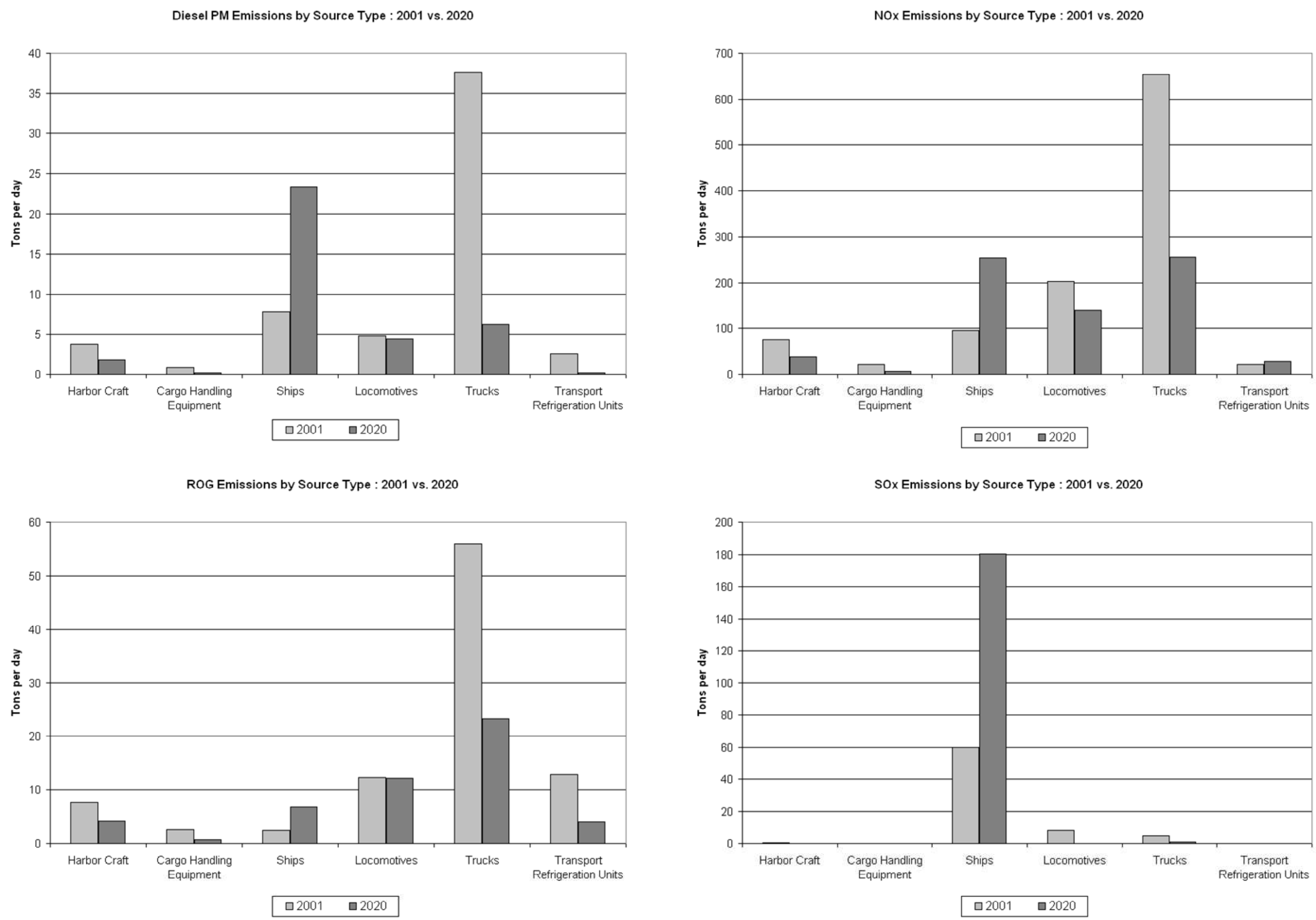


**Figure 10. Statewide Goods Movement Emissions: 2001 vs. 2020**

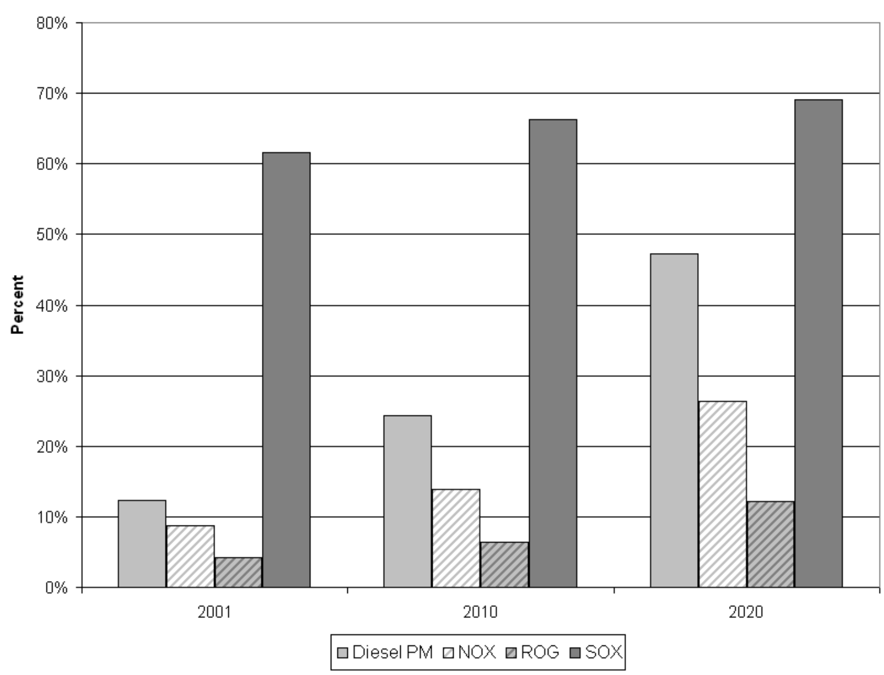


## B. SUMMARY OF EMISSIONS BY REGION

Ocean-going ships and harbor craft are a major source of goods movement related emissions. Most emissions from these categories are generated in shipping lanes off the coast of California in the outer continental shelf, as ships move from one port to another. Figure 11 presents the percentage of goods movement emissions released by ships and harbor craft over the open ocean relative to total goods movement emissions. As the figure shows, a relatively large percentage of total goods movement SOx and diesel PM emissions are generated over the open ocean out to 24 nautical miles.

California has five major goods movement corridors: (1) the South Coast Region, (2) the San Francisco Bay Area, (3) the San Diego Region, (4) the San Joaquin Valley, and (5), the Sacramento Region. Regions like the South Coast and the San Francisco Bay Area are major centers of goods movement because they contain the largest ports in California. In particular, the South Coast region contains the largest ports in the United States and southern California's economy and transportation infrastructure has developed around these ports. The San Joaquin Valley and Sacramento Region are major corridors for transport of goods by truck and rail, and also contains the Ports of Stockton and Sacramento. The San Diego region contains a major metropolitan area, a port, and the Mexican Border.

**Figure 11. Percent of Total Goods Movement Emission in the Outer Continental Shelf to 24 Miles offshore**



1. SOUTH COAST REGION

The South Coast region consists of the South Coast air basin, including portions of the counties of Los Angeles, Orange, San Bernardino and Riverside, and the portion of the Outer Continental Shelf bordering these counties. The South Coast region contains the Ports of Los Angeles and Long Beach. In 2004, these two ports combined handled over 12 million twenty foot equivalent units of containers. These ports are also the fourth largest port for cargo volume (in tons) in North America, and the largest port in the United States by value of imported goods (AAPA, 2005).

In the South Coast region, ship traffic is dominated by container vessel traffic, as shown in Table 28. In 2004, 53% of all port calls in this region were from container ships. Tanker ships were the next most common ship type visiting the South Coast region. About 75% of all goods passing through the Ports of Los Angeles and Long Beach are imported from overseas.

**Table 28.**
**2004 Port Calls in South Coast Region**

| Vessel Type | Port Calls | % of Region |
|---|---|---|
| Auto | 198 | 4% |
| Bulk | 496 | 9% |
| Container | 2905 | 53% |
| General | 195 | 4% |
| Passenger | 410 | 7% |
| Reefer | 131 | 2% |
| Roro | 87 | 2% |
| Tanker | 1005 | 18% |
| **South Coast Total** | **5506** | **100%** |

Table 29 shows the goods movement related emissions for the South Coast region. Overall, about 60% of the Diesel PM and NOx emissions are from trucks. Emissions from trains account for about 17% NOx and 7% Diesel PM Emissions. Ships contribute about 12% to the NOx emissions and 18% to Diesel PM. Ship emissions contribute about 90% of the total SOX emissions, however, due to their use of high sulfur content fuels.

**Table 29.**
**2001 Goods Movement Emissions in South Coast Region**
**(including associated emissions up to 24 nautical miles offshore)**
**(tons/day)**

| Description | Diesel PM | NOX | ROG | SOX |
|---|---|---|---|---|
| Cargo Handling Equipment | 0.6 | 15 | 2 | <1 |
| Harbor Craft | 1.0 | 21 | 2 | <1 |
| Ships | 2.4 | 30 | 1 | 20 |
| Locomotives | 1.0 | 43 | 3 | 1 |
| Transport Refrigeration Units | 0.9 | 7 | 4 | <1 |
| Trucks | 8.2 | 140 | 11 | 1 |
| **Region Total** | **14.1** | **256** | **23** | **22** |

SOx emissions in the South Coast region are forecasted to increase between 2001 and 2020, while Diesel PM and NOx emissions are projected to decrease. The changes are mostly due to the significant increase in emissions from ships and the emission control measurements to be implemented for the other source categories. Ship emissions are forecasted to triple between 2001 and 2020 in the South Coast. This growth will affect not just ocean-going ships, but all categories involved in handling or moving imported goods. Table 30 shows the total forecasted emissions for the South Coast region.

| Table 30. Forecasted Goods Movement Emissions in South Coast Region (including associated emissions in the outer continental shelf) (tons/day) | | | | |
|---|---|---|---|---|
| **Pollutant** | **2001** | **2010** | **2015** | **2020** |
| Diesel PM | 14.1 | 12.5 | 11.0 | 10.9 |
| NOx | 256 | 238 | 212 | 197 |
| ROG | 23 | 18 | 15 | 13 |
| SOX | 22 | 42 | 52 | 65 |

2. SAN FRANCISCO BAY AREA

The San Francisco Bay Region consists of the counties surrounding the San Francisco Bay, including the counties of San Francisco, San Mateo, Santa Clara, Alameda, Western Solano, Southern Sonoma, Napa, Marin, and Contra Costa, and the portion of the Outer Continental Shelf bordering these counties. The San Francisco Bay region includes the ports of Oakland, Richmond, Redwood City, San Francisco, Carquinez Straits and Alameda. The San Francisco Bay region is unique in that ship traffic en route to Stockton and Sacramento must pass through the San Francisco Bay region.

Table 31 displays port calls to the San Francisco Bay Region in 2004. In 2004, there were only 60% as many port calls by ships in the San Francisco Bay region as there were in the South Coast. Like the South Coast, container ships accounted for more than half of the port calls, although the total container throughput of the San Francisco Bay region is only about 15% of that of the South Coast region. Unlike the South Coast region, however, the Port of Oakland handles more tons of exported goods than imported goods. Tanker ships accounted for almost one quarter of the port calls due to the presence of several large refineries in the region.

| Table 31. 2004 Port Calls in San Francisco Bay Region | | |
|---|---|---|
| **Vessel Type** | **Port Calls** | **% of Region** |
| Auto | 116 | 4% |
| Bulk | 265 | 8% |
| Container | 1766 | 55% |
| General | 108 | 3% |
| Passenger | 78 | 2% |
| Roro | 86 | 3% |
| Tanker | 778 | 24% |
| **San Francisco Bay Total** | **3197** | **100%** |

Table 32 shows the goods movement emissions for the San Francisco Bay region. Harbor craft and ships combined account for about 40% of the NOx and Diesel PM emissions. Sulfur oxide emissions are almost all from ships. Trucks account for a smaller percent of the total regional NOx and Diesel PM emissions than the South Coast; about 43 percent and 41 percent of the regional emissions respectively.

**Table 32.**
**2001 Goods Movement Emissions in San Francisco Bay Area Region (including associated emissions in the outer continental shelf) (tons/day)**

| Description | Diesel PM | NOX | ROG | SOX |
|---|---|---|---|---|
| Cargo Handling Equipment | 0.1 | 4 | <1 | <1 |
| Harbor Craft | 1.3 | 27 | 3 | <1 |
| Ships | 1.4 | 17 | <1 | 11 |
| Locomotives | 0.3 | 16 | 1 | <1 |
| Transport Refrigeration Units | 0.5 | 4 | 3 | <1 |
| Trucks | 2.5 | 52 | 5 | <1 |
| **Region Total** | **6.1** | **120** | **12** | **11** |

Table 33 shows the forecasted goods movement emissions for the San Francisco Bay region. Emissions from ships are forecasted to more than double between 2001 and 2020 in the San Francisco Bay region, due to increasing imports to California. By 2020, ships will account for more than 75% of the diesel PM emissions, and 40% of the NOx emissions in San Francisco Bay region.

**Table 33.**
**Forecasted Goods Movement Emissions in San Francisco Bay Region (including associated emissions in the outer continental shelf) (tons/day)**

| Pollutant | 2001 | 2010 | 2015 | 2020 |
|---|---|---|---|---|
| Diesel PM | 6 | 5 | 5 | 5 |
| NOx | 120 | 107 | 97 | 96 |
| ROG | 12 | 9 | 7 | 6 |
| SOX | 11 | 17 | 22 | 29 |

3. SAN DIEGO

This region consists of San Diego County and the Outer Continental Shelf bordering San Diego County. The only significant port in this region is in San Diego. Table 34 displays the total number of ships calling upon the Port of San Diego. The total number of port calls in San Diego is only 8 percent of total port call in the South Coast region. Over 60 percent of the port calls in San Diego were from passenger vessels and auto carriers. Tanker ships do not call on the Port of San Diego, but generate emissions off the coast of San Diego in the Pacific Lightering area.

| Table 34. | | |
|---|---|---|
| 2004 Port Calls in San Diego Region | | |
| **Vessel Type** | **Port Calls** | **% of Region** |
| Auto | 135 | 29% |
| Bulk | 40 | 9% |
| Container | 14 | 3% |
| General | 90 | 19% |
| Passenger | 180 | 39% |
| Reefer | 5 | 1% |
| **San Diego Total** | **464** | **100%** |

Trucks contribute more than half of the Diesel PM and NOx emissions in 2001, as shown in Table 35. Combined, ships and harbor craft account for about 40% of NOx and Diesel PM emissions in San Diego region.

| Table 35. 2001 Goods Movement Emissions in San Diego Region (including associated emissions in the outer continental shelf) (tons/day) | | | | |
|---|---|---|---|---|
| **Description** | **Diesel PM** | **NOX** | **ROG** | **SOX** |
| Cargo Handling Equipment | <0.1 | 1 | <1 | <1 |
| Harbor Craft | 0.5 | 11 | 1 | <1 |
| Ships | 0.7 | 8 | <1 | 5 |
| Locomotives | <0.1 | 1 | <1 | <1 |
| Transport Refrigeration Units | 0.2 | 2 | 1 | <1 |
| Trucks | 1.4 | 26 | 3 | <1 |
| **Region Total** | **2.8** | **49** | **5** | **5** |

Table 36 provides forecasted emissions in the San Diego region from 2001 to 2020. Emissions are forecasted to grow due to the large growth rates forecasted for the Port of San Diego. Emissions from ships are forecasted to increase by a factor of 5 between 2001 and 2020. The surrogate used for the ship growth rate is the installed power of ships; the growth rate of passenger vessels' installed power is also forecast to grow by a similar amount. Because the engines on passenger vessels are proportionately much larger than other types of vessels and because passenger vessels account for about 40% of the port calls in San Diego, the growth rate for San Diego follows that of passenger vessels.

| Table 36. Forecasted Goods Movement Emissions in San Diego Region (including associated emissions in the outer continental shelf) (tons/day) | | | | |
|---|---|---|---|---|
| **Pollutant** | **2001** | **2010** | **2015** | **2020** |
| Diesel PM | 2.8 | 2.7 | 3.1 | 4.2 |
| NOx | 48 | 48 | 49 | 59 |
| ROG | 5 | 4 | 3 | 3 |
| SOx | 5 | 11 | 17 | 27 |

## 4. SAN JOAQUIN VALLEY

The San Joaquin Valley is the agricultural heart of California. The Port of Stockton is located in the region.

In 2004, more than 100 ships called upon the Port of Stockton. About half of the ships were bulk freighters, as shown in Table 37.

| **Table 37. 2004 Port Calls in San Joaquin Valley Region** | | |
|---|---|---|
| **Vessel Type** | **Port Calls** | **% of Region** |
| Bulk | 63 | 53% |
| General | 18 | 15% |
| Tanker | 39 | 33% |
| **San Joaquin Valley Region Total** | **120** | **100%** |

Table 38 presents goods movement emissions by source category in the San Joaquin Valley for the base year 2001. Goods movement emissions in the San Joaquin Valley region are dominated by truck and train traffic; ship and harbor craft emissions generate a relatively small portion of the emissions in this region. Goods movement emissions in the San Joaquin Valley are forecasted to decline between 2001 and 20205, as shown in Table 39. This is due to existing and controls on trucks and trains. This decline in emissions is expected to occur despite increases in the vehicle miles traveled by these sources as a result of increased goods movement. Ship emissions are expected to grow by a modest amount, and are projected to be the dominant contributor of SOx emissions in the San Joaquin Valley in future years.

| **Table 38. 2001 Goods Movement Emissions in San Joaquin Valley Region (tons/day)** | | | | |
|---|---|---|---|---|
| **Description** | **Diesel PM** | **NOX** | **ROG** | **SOX** |
| Cargo Handling Equipment | <0.1 | 1 | <1 | <1 |
| Harbor Craft | <0.1 | 1 | <1 | <1 |
| Ships | <0.1 | <1 | <1 | <1 |
| Locomotives | 0.6 | 30 | 2 | 1 |
| Transport Refrigeration Units | 0.4 | 3 | 2 | <1 |
| Trucks | 10.0 | 183 | 14 | 1 |
| **Region Total** | **11.0** | **218** | **18** | **2** |

| Table 39. | | | | |
|---|---|---|---|---|
| **Forecasted Goods Movement Emissions in San Joaquin Valley Region (tons/day** | | | | |
| **Pollutant** | **2001** | **2010** | **2015** | **2020** |
| Diesel PM | 11.0 | 5.7 | 3.4 | 2.3 |
| NOx | 218 | 160 | 118 | 92 |
| ROG | 18 | 13 | 10 | 8 |
| SOX | 2 | 1 | 1 | 1 |

4. SACRAMENTO REGION

The Sacramento Region is a major agricultural center of California that also has significant freeway and rail infrastructure as well as a small port in Sacramento. In 2004, less than 50 ships called upon the Port of Sacramento. About half of the ships were bulk freighters, as shown in Table 40.

| Table 40. | | |
|---|---|---|
| **2004 Port Calls in Sacramento Region** | | |
| **Vessel Type** | **Port Calls** | **% of Region** |
| Bulk | 23 | 50% |
| General | 19 | 41% |
| Tanker | 4 | 9% |
| **Sacramento Region Total** | **46** | **100%** |

Table 41 displays goods movement emissions by source category in the Sacramento Region for the base year 2001. Almost all of the Diesel PM and NOx emissions are from trucks and trains. Like in the San Joaquin Valley, goods movement emissions in the Sacramento Region are forecasted to decline between 2001 and 2020, as shown in Table 42. Similar to other regions, ships are projected to be the dominant contributor of SOx emission in future years.

| Table 41. | | | | |
|---|---|---|---|---|
| **2001 Goods Movement Emissions in Sacramento Region (tons/day)** | | | | |
| **Description** | **Diesel PM** | **NOX** | **ROG** | **SOX** |
| Cargo Handling Equipment | <0.1 | <1 | <1 | <1 |
| Harbor Craft | 0.1 | 2 | <1 | <1 |
| Ships | <0.1 | <1 | <1 | <1 |
| Locomotives | 0.3 | 13 | 1 | 1 |
| Transport Refrigeration Units | 0.2 | 2 | 1 | <1 |
| Trucks | 1.8 | 34 | 3 | <1 |
| **Region Total** | **2.4** | **51** | **5** | **1** |

| Table 42. | | | | |
|---|---|---|---|---|
| **Forecasted Goods Movement Emissions in Sacramento Region (tons/day)** | | | | |
| **Pollutant** | **2001** | **2010** | **2015** | **2020** |
| Diesel PM | 2.4 | 1.4 | 1.0 | 0.6 |
| NOx | 51 | 38 | 30 | 26 |
| ROG | 5 | 4 | 3 | 2 |
| SOX | 1 | <1 | <1 | <1 |

**EMISSIONS INVENTORY DETAIL**

Table 43 presents ARB's ports and international goods movement emissions summarized by source category, county, air basin, district, facility, and pollutant for the years 2001, 2010, and 2020. This table provides a detailed output of the complete inventory. The complete emissions inventory database is available upon request.

Data codes are as follows:

- Type: OGV (Ocean-Going Ships), CHC (Commercial Harbor Craft), CHE (Cargo Handling Equipment), TRK (Heavy-Duty Trucks), RAIL (Locomotives), and TRU (Transport Refrigeration Units).

- County

| | | | |
|---|---|---|---|
| 1 | Alameda | 30 | Orange |
| 2 | Alpine | 31 | Placer |
| 3 | Amador | 32 | Plumas |
| 4 | Butte | 33 | Riverside |
| 5 | Calaveras | 34 | Sacramento |
| 6 | Colusa | 35 | San Benito |
| 7 | Contra Costa | 36 | San Bernardino |
| 8 | Del Norte | 37 | San Diego |
| 9 | El Dorado | 38 | San Francisco |
| 10 | Fresno | 39 | San Joaquin |
| 11 | Glenn | 40 | San Luis Obispo |
| 12 | Humboldt | 41 | San Mateo |
| 13 | Imperial | 42 | Santa Barbara |
| 14 | Inyo | 43 | Santa Clara |
| 15 | Kern | 44 | Santa Cruz |
| 16 | Kings | 45 | Shasta |
| 17 | Lake | 46 | Sierra |
| 18 | Lassen | 47 | Siskiyou |
| 19 | Los Angeles | 48 | Solano |
| 20 | Madera | 49 | Sonoma |
| 21 | Marin | 50 | Stanislaus |
| 22 | Mariposa | 51 | Sutter |
| 23 | Mendocino | 52 | Tehama |
| 24 | Merced | 53 | Trinity |
| 25 | Modoc | 54 | Tulare |
| 26 | Mono | 55 | Tuolumne |
| 27 | Monterey | 56 | Ventura |
| 28 | Napa | 57 | Yolo |
| 29 | Nevada | 58 | Yuba |

- Air Basin

| | |
|---|---|
| SF | San Francisco |
| GBV | Great Basin Valley |
| MC | Mountain Counties |
| SV | Sacramento Valley |
| OCS | Outer Continental Shelf |
| LT | Lake Tahoe |
| SJV | San Joaquin Valley |
| NC | North Coast |
| NCC | North Central Coast |
| SCC | South Central Coast |
| MD | Mojave Desert |
| SS | Salton Sea |
| SD | San Diego |
| SC | South Coast |
| NEP | North East Plateau |
| LC | Lake County |

- District

| | |
|---|---|
| BA | Bay Area AQMD |
| GBU | Great Basin Unified APCD |
| AMA | Amador County APCD |
| BUT | Butte County APCD |
| CAL | Calaveras County APCD |
| COL | Colusa County APCD |
| NCU | North Coast Unified APCD |
| ED | El Dorado County APCD |
| SJU | San Joaquin Valley Unified APCD |
| GLE | Glenn County APCD |
| IMP | Imperial County APCD |
| KER | Kern County APCD |
| LAK | Lake County APCD |
| LAS | Lassen County APCD |
| AV | Antelope Valley APCD |
| SC | South Coast AQMD |
| MPA | Mariposa County APCD |
| MEN | Mendocino County AQMD |
| MOD | Modoc County APCD |
| MBU | Monterey Bay Unified APCD |
| NSI | Northern Sierra AQMD |
| PLA | Placer County APCD |
| MOJ | Mojave Desert AQMD |
| SD | San Diego APCD |
| SLO | San Luis Obispo County APCD |
| SB | Santa Barbara County APCD |
| SHA | Shasta County APCD |
| SIS | Siskiyou County APCD |
| YS | Yolo-Solano APCD |
| FR | Feather River AQMD |
| TEH | Tehama County APCD |
| TUO | Tuolumne County APCD |
| VEN | Ventura County APCD |

- Facility Type: NOFAC (No Facility Type), PORT (Port), (YARD) Rail yard.

- 2001, 2010, 2020: Emissions (tons per day), rounded to 2 decimal places for Diesel PM and 1 decimal place for the other pollutants.

| Table 43. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2001, 2010, and 2020 Detailed Goods Movement Emissions Estimates by Source Category, County, Air Basin, District, and Facility Type. (Tons/Day) | | | | | | | | |
| **TYPE** | **County** | **AB** | **DIS** | **FACTYP** | **POL** | **2001** | **2010** | **2020** |
| CHC | 1 | SF | BA | NOFAC | DPM | 0.24 | 0.21 | 0.15 |
| CHC | 1 | SF | BA | NOFAC | NOX | 4.7 | 4.0 | 3.2 |
| CHC | 1 | SF | BA | NOFAC | ROG | 0.5 | 0.4 | 0.3 |
| CHC | 1 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 1 | SF | BA | PORT | DPM | 0.87 | 0.74 | 0.50 |
| CHC | 1 | SF | BA | PORT | NOX | 17.6 | 14.1 | 10.5 |
| CHC | 1 | SF | BA | PORT | ROG | 1.8 | 1.5 | 1.1 |
| CHC | 1 | SF | BA | PORT | SOX | 0.1 | 0.0 | 0.0 |
| CHC | 7 | SF | BA | NOFAC | DPM | 0.02 | 0.02 | 0.01 |
| CHC | 7 | SF | BA | NOFAC | NOX | 0.5 | 0.4 | 0.3 |
| CHC | 7 | SF | BA | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| CHC | 7 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 7 | SF | BA | PORT | DPM | 0.09 | 0.07 | 0.05 |
| CHC | 7 | SF | BA | PORT | NOX | 1.8 | 1.4 | 1.0 |
| CHC | 7 | SF | BA | PORT | ROG | 0.2 | 0.1 | 0.1 |
| CHC | 7 | SF | BA | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 9 | LT | ED | NOFAC | DPM | 0.02 | 0.01 | 0.01 |
| CHC | 9 | LT | ED | NOFAC | NOX | 0.4 | 0.3 | 0.2 |
| CHC | 9 | LT | ED | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| CHC | 9 | LT | ED | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 12 | NC | NCU | PORT | DPM | 0.04 | 0.03 | 0.02 |
| CHC | 12 | NC | NCU | PORT | NOX | 0.7 | 0.5 | 0.3 |
| CHC | 12 | NC | NCU | PORT | ROG | 0.1 | 0.1 | 0.0 |
| CHC | 12 | NC | NCU | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 12 | OCS | NCU | NOFAC | DPM | 0.05 | 0.03 | 0.02 |
| CHC | 12 | OCS | NCU | NOFAC | NOX | 0.8 | 0.6 | 0.4 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| CHC | 12 | OCS | NCU | NOFAC | ROG | 0.1 | 0.1 | 0.0 |
| CHC | 12 | OCS | NCU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 19 | OCS | SC | NOFAC | DPM | 0.47 | 0.35 | 0.21 |
| CHC | 19 | OCS | SC | NOFAC | NOX | 9.6 | 6.9 | 4.5 |
| CHC | 19 | OCS | SC | NOFAC | ROG | 1.0 | 0.7 | 0.5 |
| CHC | 19 | OCS | SC | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 19 | SC | SC | NOFAC | DPM | 0.37 | 0.28 | 0.16 |
| CHC | 19 | SC | SC | NOFAC | NOX | 7.9 | 5.6 | 3.6 |
| CHC | 19 | SC | SC | NOFAC | ROG | 0.8 | 0.6 | 0.4 |
| CHC | 19 | SC | SC | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 19 | SC | SC | PORT | DPM | 0.19 | 0.15 | 0.09 |
| CHC | 19 | SC | SC | PORT | NOX | 3.8 | 2.7 | 1.8 |
| CHC | 19 | SC | SC | PORT | ROG | 0.4 | 0.3 | 0.2 |
| CHC | 19 | SC | SC | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 23 | NC | MEN | NOFAC | DPM | 0.02 | 0.01 | 0.01 |
| CHC | 23 | NC | MEN | NOFAC | NOX | 0.3 | 0.3 | 0.2 |
| CHC | 23 | NC | MEN | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| CHC | 23 | NC | MEN | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 23 | OCS | MEN | NOFAC | DPM | 0.03 | 0.02 | 0.01 |
| CHC | 23 | OCS | MEN | NOFAC | NOX | 0.6 | 0.4 | 0.3 |
| CHC | 23 | OCS | MEN | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| CHC | 23 | OCS | MEN | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 27 | NCC | MBU | NOFAC | DPM | 0.06 | 0.04 | 0.03 |
| CHC | 27 | NCC | MBU | NOFAC | NOX | 1.2 | 0.9 | 0.6 |
| CHC | 27 | NCC | MBU | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| CHC | 27 | NCC | MBU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 27 | OCS | MBU | NOFAC | DPM | 0.10 | 0.07 | 0.04 |
| CHC | 27 | OCS | MBU | NOFAC | NOX | 2.1 | 1.4 | 0.9 |
| CHC | 27 | OCS | MBU | NOFAC | ROG | 0.2 | 0.2 | 0.1 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| CHC | 27 | OCS | MBU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 31 | LT | PLA | NOFAC | DPM | 0.02 | 0.01 | 0.01 |
| CHC | 31 | LT | PLA | NOFAC | NOX | 0.4 | 0.3 | 0.2 |
| CHC | 31 | LT | PLA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| CHC | 31 | LT | PLA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 37 | OCS | SD | NOFAC | DPM | 0.08 | 0.06 | 0.04 |
| CHC | 37 | OCS | SD | NOFAC | NOX | 1.6 | 1.2 | 0.8 |
| CHC | 37 | OCS | SD | NOFAC | ROG | 0.2 | 0.1 | 0.1 |
| CHC | 37 | OCS | SD | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 37 | SD | SD | PORT | DPM | 0.44 | 0.33 | 0.18 |
| CHC | 37 | SD | SD | PORT | NOX | 9.2 | 6.5 | 3.8 |
| CHC | 37 | SD | SD | PORT | ROG | 0.9 | 0.7 | 0.4 |
| CHC | 37 | SD | SD | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 38 | OCS | BA | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| CHC | 38 | OCS | BA | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| CHC | 38 | OCS | BA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| CHC | 38 | OCS | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 38 | SF | BA | NOFAC | DPM | 0.04 | 0.04 | 0.02 |
| CHC | 38 | SF | BA | NOFAC | NOX | 0.8 | 0.7 | 0.5 |
| CHC | 38 | SF | BA | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| CHC | 38 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 38 | SF | BA | PORT | DPM | 0.02 | 0.02 | 0.01 |
| CHC | 38 | SF | BA | PORT | NOX | 0.4 | 0.3 | 0.2 |
| CHC | 38 | SF | BA | PORT | ROG | 0.0 | 0.0 | 0.0 |
| CHC | 38 | SF | BA | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 39 | SJV | SJU | NOFAC | DPM | 0.01 | 0.01 | 0.01 |
| CHC | 39 | SJV | SJU | NOFAC | NOX | 0.2 | 0.2 | 0.1 |
| CHC | 39 | SJV | SJU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| CHC | 39 | SJV | SJU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| CHC | 39 | SJV | SJU | PORT | DPM | 0.03 | 0.02 | 0.01 |
| CHC | 39 | SJV | SJU | PORT | NOX | 0.6 | 0.4 | 0.3 |
| CHC | 39 | SJV | SJU | PORT | ROG | 0.1 | 0.0 | 0.0 |
| CHC | 39 | SJV | SJU | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 40 | OCS | SLO | NOFAC | DPM | 0.04 | 0.03 | 0.02 |
| CHC | 40 | OCS | SLO | NOFAC | NOX | 0.8 | 0.6 | 0.4 |
| CHC | 40 | OCS | SLO | NOFAC | ROG | 0.1 | 0.1 | 0.0 |
| CHC | 40 | OCS | SLO | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 40 | SCC | SLO | NOFAC | DPM | 0.02 | 0.01 | 0.01 |
| CHC | 40 | SCC | SLO | NOFAC | NOX | 0.3 | 0.2 | 0.1 |
| CHC | 40 | SCC | SLO | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| CHC | 40 | SCC | SLO | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 41 | OCS | BA | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| CHC | 41 | OCS | BA | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| CHC | 41 | OCS | BA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| CHC | 41 | OCS | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 41 | SF | BA | PORT | DPM | 0.03 | 0.03 | 0.02 |
| CHC | 41 | SF | BA | PORT | NOX | 0.6 | 0.5 | 0.4 |
| CHC | 41 | SF | BA | PORT | ROG | 0.1 | 0.1 | 0.0 |
| CHC | 41 | SF | BA | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 42 | OCS | SB | NOFAC | DPM | 0.13 | 0.10 | 0.06 |
| CHC | 42 | OCS | SB | NOFAC | NOX | 2.1 | 1.6 | 1.1 |
| CHC | 42 | OCS | SB | NOFAC | ROG | 0.2 | 0.2 | 0.1 |
| CHC | 42 | OCS | SB | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 42 | SCC | SB | NOFAC | DPM | 0.03 | 0.02 | 0.01 |
| CHC | 42 | SCC | SB | NOFAC | NOX | 0.6 | 0.4 | 0.3 |
| CHC | 42 | SCC | SB | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| CHC | 42 | SCC | SB | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 49 | NC | NS | PORT | DPM | 0.02 | 0.01 | 0.01 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| CHC | 49 | NC | NS | PORT | NOX | 0.3 | 0.2 | 0.2 |
| CHC | 49 | NC | NS | PORT | ROG | 0.0 | 0.0 | 0.0 |
| CHC | 49 | NC | NS | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 49 | OCS | NS | NOFAC | DPM | 0.03 | 0.02 | 0.01 |
| CHC | 49 | OCS | NS | NOFAC | NOX | 0.7 | 0.5 | 0.3 |
| CHC | 49 | OCS | NS | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| CHC | 49 | OCS | NS | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 56 | OCS | VEN | NOFAC | DPM | 0.11 | 0.08 | 0.05 |
| CHC | 56 | OCS | VEN | NOFAC | NOX | 1.9 | 1.4 | 0.9 |
| CHC | 56 | OCS | VEN | NOFAC | ROG | 0.2 | 0.2 | 0.1 |
| CHC | 56 | OCS | VEN | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 56 | SCC | VEN | PORT | DPM | 0.03 | 0.02 | 0.01 |
| CHC | 56 | SCC | VEN | PORT | NOX | 0.6 | 0.5 | 0.3 |
| CHC | 56 | SCC | VEN | PORT | ROG | 0.1 | 0.0 | 0.0 |
| CHC | 56 | SCC | VEN | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 57 | SV | YS | NOFAC | DPM | 0.02 | 0.01 | 0.01 |
| CHC | 57 | SV | YS | NOFAC | NOX | 0.4 | 0.2 | 0.2 |
| CHC | 57 | SV | YS | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| CHC | 57 | SV | YS | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| CHC | 57 | SV | YS | PORT | DPM | 0.07 | 0.06 | 0.03 |
| CHC | 57 | SV | YS | PORT | NOX | 1.4 | 1.0 | 0.7 |
| CHC | 57 | SV | YS | PORT | ROG | 0.1 | 0.1 | 0.1 |
| CHC | 57 | SV | YS | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 1 | SF | BA | PORT | DPM | 0.10 | 0.06 | 0.02 |
| CHE | 1 | SF | BA | PORT | NOX | 2.7 | 2.0 | 0.8 |
| CHE | 1 | SF | BA | PORT | ROG | 0.3 | 0.1 | 0.1 |
| CHE | 1 | SF | BA | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 1 | SF | BA | YARD | DPM | 0.00 | 0.00 | 0.00 |
| CHE | 1 | SF | BA | YARD | NOX | 0.1 | 0.1 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| CHE | 1 | SF | BA | YARD | ROG | 0.0 | 0.0 | 0.0 |
| CHE | 1 | SF | BA | YARD | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 7 | SF | BA | PORT | DPM | 0.02 | 0.01 | 0.00 |
| CHE | 7 | SF | BA | PORT | NOX | 0.5 | 0.4 | 0.1 |
| CHE | 7 | SF | BA | PORT | ROG | 0.1 | 0.0 | 0.0 |
| CHE | 7 | SF | BA | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 7 | SF | BA | YARD | DPM | 0.00 | 0.00 | 0.00 |
| CHE | 7 | SF | BA | YARD | NOX | 0.0 | 0.0 | 0.0 |
| CHE | 7 | SF | BA | YARD | ROG | 0.0 | 0.0 | 0.0 |
| CHE | 7 | SF | BA | YARD | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 10 | SJV | SJU | YARD | DPM | 0.00 | 0.00 | 0.00 |
| CHE | 10 | SJV | SJU | YARD | NOX | 0.0 | 0.0 | 0.0 |
| CHE | 10 | SJV | SJU | YARD | ROG | 0.0 | 0.0 | 0.0 |
| CHE | 10 | SJV | SJU | YARD | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 12 | NC | NCU | PORT | DPM | 0.00 | 0.00 | 0.00 |
| CHE | 12 | NC | NCU | PORT | NOX | 0.1 | 0.1 | 0.0 |
| CHE | 12 | NC | NCU | PORT | ROG | 0.0 | 0.0 | 0.0 |
| CHE | 12 | NC | NCU | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 19 | SC | SC | PORT | DPM | 0.55 | 0.33 | 0.12 |
| CHE | 19 | SC | SC | PORT | NOX | 14.0 | 10.6 | 4.0 |
| CHE | 19 | SC | SC | PORT | ROG | 1.7 | 0.8 | 0.4 |
| CHE | 19 | SC | SC | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 19 | SC | SC | YARD | DPM | 0.03 | 0.03 | 0.01 |
| CHE | 19 | SC | SC | YARD | NOX | 0.9 | 0.8 | 0.5 |
| CHE | 19 | SC | SC | YARD | ROG | 0.1 | 0.1 | 0.1 |
| CHE | 19 | SC | SC | YARD | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 36 | SC | SC | YARD | DPM | 0.00 | 0.00 | 0.00 |
| CHE | 36 | SC | SC | YARD | NOX | 0.1 | 0.1 | 0.0 |
| CHE | 36 | SC | SC | YARD | ROG | 0.0 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| CHE | 36 | SC | SC | YARD | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 37 | SD | SD | PORT | DPM | 0.03 | 0.02 | 0.01 |
| CHE | 37 | SD | SD | PORT | NOX | 0.8 | 0.6 | 0.2 |
| CHE | 37 | SD | SD | PORT | ROG | 0.1 | 0.0 | 0.0 |
| CHE | 37 | SD | SD | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 38 | SF | BA | PORT | DPM | 0.01 | 0.01 | 0.00 |
| CHE | 38 | SF | BA | PORT | NOX | 0.3 | 0.2 | 0.1 |
| CHE | 38 | SF | BA | PORT | ROG | 0.0 | 0.0 | 0.0 |
| CHE | 38 | SF | BA | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 39 | SJV | SJU | PORT | DPM | 0.02 | 0.01 | 0.00 |
| CHE | 39 | SJV | SJU | PORT | NOX | 0.5 | 0.4 | 0.1 |
| CHE | 39 | SJV | SJU | PORT | ROG | 0.1 | 0.0 | 0.0 |
| CHE | 39 | SJV | SJU | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 39 | SJV | SJU | YARD | DPM | 0.00 | 0.00 | 0.00 |
| CHE | 39 | SJV | SJU | YARD | NOX | 0.1 | 0.1 | 0.1 |
| CHE | 39 | SJV | SJU | YARD | ROG | 0.0 | 0.0 | 0.0 |
| CHE | 39 | SJV | SJU | YARD | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 41 | SF | BA | PORT | DPM | 0.01 | 0.00 | 0.00 |
| CHE | 41 | SF | BA | PORT | NOX | 0.2 | 0.1 | 0.1 |
| CHE | 41 | SF | BA | PORT | ROG | 0.0 | 0.0 | 0.0 |
| CHE | 41 | SF | BA | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 56 | SCC | VEN | PORT | DPM | 0.03 | 0.02 | 0.01 |
| CHE | 56 | SCC | VEN | PORT | NOX | 0.7 | 0.6 | 0.2 |
| CHE | 56 | SCC | VEN | PORT | ROG | 0.1 | 0.0 | 0.0 |
| CHE | 56 | SCC | VEN | PORT | SOX | 0.0 | 0.0 | 0.0 |
| CHE | 57 | SV | YS | PORT | DPM | 0.00 | 0.00 | 0.00 |
| CHE | 57 | SV | YS | PORT | NOX | 0.1 | 0.1 | 0.0 |
| CHE | 57 | SV | YS | PORT | ROG | 0.0 | 0.0 | 0.0 |
| CHE | 57 | SV | YS | PORT | SOX | 0.0 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| OGV | 1 | SF | BA | NOFAC | DPM | 0.00 | 0.01 | 0.01 |
| OGV | 1 | SF | BA | NOFAC | NOx | 0.1 | 0.1 | 0.1 |
| OGV | 1 | SF | BA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 1 | SF | BA | NOFAC | SOX | 0.0 | 0.1 | 0.1 |
| OGV | 1 | SF | BA | PORT | DPM | 0.17 | 0.29 | 0.48 |
| OGV | 1 | SF | BA | PORT | NOx | 2.3 | 3.6 | 5.8 |
| OGV | 1 | SF | BA | PORT | ROG | 0.0 | 0.1 | 0.1 |
| OGV | 1 | SF | BA | PORT | SOX | 1.4 | 2.3 | 3.8 |
| OGV | 7 | SF | BA | NOFAC | DPM | 0.02 | 0.03 | 0.04 |
| OGV | 7 | SF | BA | NOFAC | NOx | 0.2 | 0.3 | 0.5 |
| OGV | 7 | SF | BA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 7 | SF | BA | NOFAC | SOX | 0.1 | 0.2 | 0.3 |
| OGV | 7 | SF | BA | PORT | DPM | 0.08 | 0.13 | 0.22 |
| OGV | 7 | SF | BA | PORT | NOx | 1.0 | 1.5 | 2.5 |
| OGV | 7 | SF | BA | PORT | ROG | 0.0 | 0.0 | 0.1 |
| OGV | 7 | SF | BA | PORT | SOX | 0.7 | 1.1 | 1.8 |
| OGV | 8 | OCS | NCU | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| OGV | 8 | OCS | NCU | NOFAC | NOx | 0.0 | 0.0 | 0.0 |
| OGV | 8 | OCS | NCU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 8 | OCS | NCU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| OGV | 12 | NC | NCU | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| OGV | 12 | NC | NCU | NOFAC | NOx | 0.0 | 0.0 | 0.0 |
| OGV | 12 | NC | NCU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 12 | NC | NCU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| OGV | 12 | NC | NCU | PORT | DPM | 0.02 | 0.00 | 0.00 |
| OGV | 12 | NC | NCU | PORT | NOx | 0.2 | 0.0 | 0.0 |
| OGV | 12 | NC | NCU | PORT | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 12 | NC | NCU | PORT | SOX | 0.1 | 0.0 | 0.0 |
| OGV | 12 | OCS | NCU | NOFAC | DPM | 0.00 | 0.00 | 0.00 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| OGV | 12 | OCS | NCU | NOFAC | NOx | 0.0 | 0.0 | 0.0 |
| OGV | 12 | OCS | NCU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 12 | OCS | NCU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| OGV | 19 | OCS | SC | NOFAC | DPM | 1.10 | 1.71 | 2.80 |
| OGV | 19 | OCS | SC | NOFAC | NOx | 13.4 | 19.8 | 30.7 |
| OGV | 19 | OCS | SC | NOFAC | ROG | 0.3 | 0.5 | 0.8 |
| OGV | 19 | OCS | SC | NOFAC | SOX | 8.6 | 13.4 | 22.2 |
| OGV | 19 | SC | SC | NOFAC | DPM | 0.22 | 0.59 | 0.80 |
| OGV | 19 | SC | SC | NOFAC | NOx | 2.7 | 6.8 | 8.8 |
| OGV | 19 | SC | SC | NOFAC | ROG | 0.1 | 0.2 | 0.2 |
| OGV | 19 | SC | SC | NOFAC | SOX | 1.7 | 4.6 | 6.3 |
| OGV | 19 | SC | SC | PORT | DPM | 0.88 | 2.36 | 3.21 |
| OGV | 19 | SC | SC | PORT | NOx | 10.6 | 26.9 | 35.0 |
| OGV | 19 | SC | SC | PORT | ROG | 0.2 | 0.6 | 0.7 |
| OGV | 19 | SC | SC | PORT | SOX | 7.4 | 19.8 | 27.3 |
| OGV | 21 | OCS | BA | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| OGV | 21 | OCS | BA | NOFAC | NOx | 0.0 | 0.0 | 0.0 |
| OGV | 21 | OCS | BA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 21 | OCS | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| OGV | 21 | SF | BA | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| OGV | 21 | SF | BA | NOFAC | NOx | 0.0 | 0.0 | 0.0 |
| OGV | 21 | SF | BA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 21 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| OGV | 23 | OCS | MEN | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| OGV | 23 | OCS | MEN | NOFAC | NOx | 0.0 | 0.0 | 0.0 |
| OGV | 23 | OCS | MEN | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 23 | OCS | MEN | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| OGV | 27 | NCC | MBU | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| OGV | 27 | NCC | MBU | NOFAC | NOx | 0.0 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| OGV | 27 | NCC | MBU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 27 | NCC | MBU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| OGV | 27 | NCC | MBU | PORT | DPM | 0.00 | 0.01 | 0.03 |
| OGV | 27 | NCC | MBU | PORT | NOx | 0.0 | 0.1 | 0.2 |
| OGV | 27 | NCC | MBU | PORT | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 27 | NCC | MBU | PORT | SOX | 0.0 | 0.1 | 0.2 |
| OGV | 27 | OCS | MBU | NOFAC | DPM | 0.00 | 0.01 | 0.02 |
| OGV | 27 | OCS | MBU | NOFAC | NOx | 0.0 | 0.1 | 0.2 |
| OGV | 27 | OCS | MBU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 27 | OCS | MBU | NOFAC | SOX | 0.0 | 0.1 | 0.2 |
| OGV | 30 | OCS | SC | NOFAC | DPM | 0.29 | 0.50 | 1.07 |
| OGV | 30 | OCS | SC | NOFAC | NOx | 3.4 | 5.5 | 10.9 |
| OGV | 30 | OCS | SC | NOFAC | ROG | 0.1 | 0.1 | 0.2 |
| OGV | 30 | OCS | SC | NOFAC | SOX | 2.3 | 4.0 | 8.6 |
| OGV | 37 | OCS | SD | NOFAC | DPM | 0.53 | 1.02 | 2.44 |
| OGV | 37 | OCS | SD | NOFAC | NOx | 6.2 | 11.0 | 24.6 |
| OGV | 37 | OCS | SD | NOFAC | ROG | 0.2 | 0.3 | 0.7 |
| OGV | 37 | OCS | SD | NOFAC | SOX | 4.0 | 7.7 | 18.5 |
| OGV | 37 | SD | SD | NOFAC | DPM | 0.04 | 0.11 | 0.34 |
| OGV | 37 | SD | SD | NOFAC | NOx | 0.5 | 1.2 | 3.4 |
| OGV | 37 | SD | SD | NOFAC | ROG | 0.0 | 0.0 | 0.1 |
| OGV | 37 | SD | SD | NOFAC | SOX | 0.3 | 0.8 | 2.6 |
| OGV | 37 | SD | SD | PORT | DPM | 0.09 | 0.26 | 0.79 |
| OGV | 37 | SD | SD | PORT | NOx | 1.1 | 2.8 | 8.2 |
| OGV | 37 | SD | SD | PORT | ROG | 0.0 | 0.1 | 0.2 |
| OGV | 37 | SD | SD | PORT | SOX | 0.7 | 2.0 | 6.2 |
| OGV | 38 | OCS | BA | NOFAC | DPM | 0.34 | 0.53 | 0.88 |
| OGV | 38 | OCS | BA | NOFAC | NOx | 4.1 | 6.1 | 9.7 |
| OGV | 38 | OCS | BA | NOFAC | ROG | 0.1 | 0.2 | 0.3 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| OGV | 38 | OCS | BA | NOFAC | SOX | 2.5 | 3.9 | 6.5 |
| OGV | 38 | SF | BA | NOFAC | DPM | 0.11 | 0.19 | 0.31 |
| OGV | 38 | SF | BA | NOFAC | NOx | 1.3 | 2.1 | 3.4 |
| OGV | 38 | SF | BA | NOFAC | ROG | 0.0 | 0.1 | 0.1 |
| OGV | 38 | SF | BA | NOFAC | SOX | 0.8 | 1.4 | 2.3 |
| OGV | 38 | SF | BA | PORT | DPM | 0.08 | 0.12 | 0.21 |
| OGV | 38 | SF | BA | PORT | NOx | 0.9 | 1.4 | 2.2 |
| OGV | 38 | SF | BA | PORT | ROG | 0.0 | 0.0 | 0.1 |
| OGV | 38 | SF | BA | PORT | SOX | 0.6 | 1.0 | 1.7 |
| OGV | 39 | SJV | SJU | NOFAC | DPM | 0.00 | 0.00 | 0.01 |
| OGV | 39 | SJV | SJU | NOFAC | NOx | 0.0 | 0.0 | 0.1 |
| OGV | 39 | SJV | SJU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 39 | SJV | SJU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| OGV | 39 | SJV | SJU | PORT | DPM | 0.03 | 0.05 | 0.09 |
| OGV | 39 | SJV | SJU | PORT | NOx | 0.3 | 0.6 | 1.0 |
| OGV | 39 | SJV | SJU | PORT | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 39 | SJV | SJU | PORT | SOX | 0.2 | 0.4 | 0.7 |
| OGV | 40 | OCS | SLO | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| OGV | 40 | OCS | SLO | NOFAC | NOx | 0.0 | 0.0 | 0.0 |
| OGV | 40 | OCS | SLO | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 40 | OCS | SLO | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| OGV | 41 | OCS | BA | NOFAC | DPM | 0.59 | 0.92 | 1.54 |
| OGV | 41 | OCS | BA | NOFAC | NOx | 7.2 | 10.6 | 16.9 |
| OGV | 41 | OCS | BA | NOFAC | ROG | 0.2 | 0.3 | 0.5 |
| OGV | 41 | OCS | BA | NOFAC | SOX | 4.3 | 6.8 | 11.4 |
| OGV | 41 | SF | BA | NOFAC | DPM | 0.00 | 0.01 | 0.01 |
| OGV | 41 | SF | BA | NOFAC | NOx | 0.0 | 0.1 | 0.1 |
| OGV | 41 | SF | BA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 41 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.1 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| OGV | 41 | SF | BA | PORT | DPM | 0.01 | 0.02 | 0.04 |
| OGV | 41 | SF | BA | PORT | NOx | 0.2 | 0.3 | 0.4 |
| OGV | 41 | SF | BA | PORT | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 41 | SF | BA | PORT | SOX | 0.1 | 0.2 | 0.3 |
| OGV | 42 | OCS | SB | NOFAC | DPM | 2.32 | 3.58 | 5.82 |
| OGV | 42 | OCS | SB | NOFAC | NOx | 28.4 | 41.5 | 64.5 |
| OGV | 42 | OCS | SB | NOFAC | ROG | 0.8 | 1.2 | 2.0 |
| OGV | 42 | OCS | SB | NOFAC | SOX | 17.1 | 26.4 | 42.9 |
| OGV | 42 | SCC | SB | PORT | DPM | 0.00 | 0.00 | 0.00 |
| OGV | 42 | SCC | SB | PORT | NOx | 0.0 | 0.0 | 0.0 |
| OGV | 42 | SCC | SB | PORT | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 42 | SCC | SB | PORT | SOX | 0.0 | 0.0 | 0.0 |
| OGV | 44 | OCS | MBU | NOFAC | DPM | 0.11 | 0.17 | 0.29 |
| OGV | 44 | OCS | MBU | NOFAC | NOx | 1.3 | 2.0 | 3.1 |
| OGV | 44 | OCS | MBU | NOFAC | ROG | 0.0 | 0.1 | 0.1 |
| OGV | 44 | OCS | MBU | NOFAC | SOX | 0.8 | 1.3 | 2.1 |
| OGV | 48 | SF | BA | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| OGV | 48 | SF | BA | NOFAC | NOx | 0.0 | 0.0 | 0.0 |
| OGV | 48 | SF | BA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 48 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| OGV | 48 | SV | YS | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| OGV | 48 | SV | YS | NOFAC | NOx | 0.0 | 0.0 | 0.0 |
| OGV | 48 | SV | YS | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 48 | SV | YS | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| OGV | 49 | OCS | NS | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| OGV | 49 | OCS | NS | NOFAC | NOx | 0.0 | 0.0 | 0.0 |
| OGV | 49 | OCS | NS | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 49 | OCS | NS | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| OGV | 56 | OCS | VEN | NOFAC | DPM | 0.71 | 1.09 | 1.77 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| OGV | 56 | OCS | VEN | NOFAC | NOx | 8.7 | 12.6 | 19.6 |
| OGV | 56 | OCS | VEN | NOFAC | ROG | 0.2 | 0.4 | 0.6 |
| OGV | 56 | OCS | VEN | NOFAC | SOX | 5.2 | 8.0 | 13.1 |
| OGV | 56 | SCC | VEN | NOFAC | DPM | 0.00 | 0.00 | 0.01 |
| OGV | 56 | SCC | VEN | NOFAC | NOx | 0.0 | 0.0 | 0.1 |
| OGV | 56 | SCC | VEN | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 56 | SCC | VEN | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| OGV | 56 | SCC | VEN | PORT | DPM | 0.04 | 0.06 | 0.10 |
| OGV | 56 | SCC | VEN | PORT | NOx | 0.5 | 0.7 | 1.1 |
| OGV | 56 | SCC | VEN | PORT | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 56 | SCC | VEN | PORT | SOX | 0.3 | 0.5 | 0.8 |
| OGV | 57 | SV | YS | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| OGV | 57 | SV | YS | NOFAC | NOx | 0.0 | 0.0 | 0.0 |
| OGV | 57 | SV | YS | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 57 | SV | YS | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| OGV | 57 | SV | YS | PORT | DPM | 0.01 | 0.02 | 0.02 |
| OGV | 57 | SV | YS | PORT | NOx | 0.2 | 0.2 | 0.2 |
| OGV | 57 | SV | YS | PORT | ROG | 0.0 | 0.0 | 0.0 |
| OGV | 57 | SV | YS | PORT | SOX | 0.1 | 0.1 | 0.2 |
| RAIL | 1 | SF | BA | NOFAC | DPM | 0.06 | 0.05 | 0.06 |
| RAIL | 1 | SF | BA | NOFAC | NOX | 3.1 | 2.0 | 2.3 |
| RAIL | 1 | SF | BA | NOFAC | ROG | 0.2 | 0.2 | 0.2 |
| RAIL | 1 | SF | BA | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 1 | SF | BA | PORT | DPM | 0.01 | 0.01 | 0.01 |
| RAIL | 1 | SF | BA | PORT | NOX | 0.3 | 0.2 | 0.2 |
| RAIL | 1 | SF | BA | PORT | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 1 | SF | BA | PORT | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 1 | SF | BA | YARD | DPM | 0.01 | 0.01 | 0.01 |
| RAIL | 1 | SF | BA | YARD | NOx | 0.4 | 0.3 | 0.3 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| RAIL | 1 | SF | BA | YARD | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 1 | SF | BA | YARD | SOx | 0.0 | 0.0 | 0.0 |
| RAIL | 3 | MC | AMA | NOFAC | DPM | 0.01 | 0.01 | 0.01 |
| RAIL | 3 | MC | AMA | NOFAC | NOX | 0.3 | 0.2 | 0.3 |
| RAIL | 3 | MC | AMA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 3 | MC | AMA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 4 | SV | BUT | NOFAC | DPM | 0.07 | 0.06 | 0.07 |
| RAIL | 4 | SV | BUT | NOFAC | NOX | 3.4 | 2.1 | 2.4 |
| RAIL | 4 | SV | BUT | NOFAC | ROG | 0.2 | 0.1 | 0.1 |
| RAIL | 4 | SV | BUT | NOFAC | SOX | 0.2 | 0.0 | 0.0 |
| RAIL | 6 | SV | COL | NOFAC | DPM | 0.02 | 0.02 | 0.02 |
| RAIL | 6 | SV | COL | NOFAC | NOX | 1.0 | 0.6 | 0.7 |
| RAIL | 6 | SV | COL | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 6 | SV | COL | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 7 | SF | BA | NOFAC | DPM | 0.04 | 0.04 | 0.04 |
| RAIL | 7 | SF | BA | NOFAC | NOX | 2.2 | 1.5 | 1.7 |
| RAIL | 7 | SF | BA | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 7 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 7 | SF | BA | PORT | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 7 | SF | BA | PORT | NOX | 0.0 | 0.0 | 0.0 |
| RAIL | 7 | SF | BA | PORT | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 7 | SF | BA | PORT | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 7 | SF | BA | YARD | DPM | 0.04 | 0.03 | 0.03 |
| RAIL | 7 | SF | BA | YARD | NOx | 1.8 | 1.1 | 1.3 |
| RAIL | 7 | SF | BA | YARD | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 7 | SF | BA | YARD | SOx | 0.0 | 0.0 | 0.0 |
| RAIL | 10 | SJV | SJU | NOFAC | DPM | 0.09 | 0.08 | 0.08 |
| RAIL | 10 | SJV | SJU | NOFAC | NOX | 4.3 | 2.7 | 2.9 |
| RAIL | 10 | SJV | SJU | NOFAC | ROG | 0.2 | 0.2 | 0.2 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| RAIL | 10 | SJV | SJU | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 10 | SJV | SJU | YARD | DPM | 0.01 | 0.01 | 0.01 |
| RAIL | 10 | SJV | SJU | YARD | NOX | 0.5 | 0.4 | 0.4 |
| RAIL | 10 | SJV | SJU | YARD | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 10 | SJV | SJU | YARD | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 11 | SV | GLE | NOFAC | DPM | 0.03 | 0.02 | 0.02 |
| RAIL | 11 | SV | GLE | NOFAC | NOX | 1.2 | 0.8 | 0.9 |
| RAIL | 11 | SV | GLE | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 11 | SV | GLE | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 12 | NC | NCU | NOFAC | DPM | 0.04 | 0.04 | 0.04 |
| RAIL | 12 | NC | NCU | NOFAC | NOX | 0.6 | 0.4 | 0.5 |
| RAIL | 12 | NC | NCU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 12 | NC | NCU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 12 | NC | NCU | PORT | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 12 | NC | NCU | PORT | NOX | 0.0 | 0.0 | 0.0 |
| RAIL | 12 | NC | NCU | PORT | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 12 | NC | NCU | PORT | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 13 | SS | IMP | NOFAC | DPM | 0.19 | 0.17 | 0.19 |
| RAIL | 13 | SS | IMP | NOFAC | NOX | 7.3 | 3.8 | 4.8 |
| RAIL | 13 | SS | IMP | NOFAC | ROG | 0.5 | 0.5 | 0.6 |
| RAIL | 13 | SS | IMP | NOFAC | SOX | 0.4 | 0.0 | 0.0 |
| RAIL | 15 | MD | KER | NOFAC | DPM | 0.22 | 0.21 | 0.23 |
| RAIL | 15 | MD | KER | NOFAC | NOX | 8.7 | 4.6 | 5.8 |
| RAIL | 15 | MD | KER | NOFAC | ROG | 0.6 | 0.6 | 0.7 |
| RAIL | 15 | MD | KER | NOFAC | SOX | 0.5 | 0.1 | 0.0 |
| RAIL | 15 | SJV | SJU | NOFAC | DPM | 0.11 | 0.10 | 0.10 |
| RAIL | 15 | SJV | SJU | NOFAC | NOX | 5.2 | 3.3 | 3.6 |
| RAIL | 15 | SJV | SJU | NOFAC | ROG | 0.3 | 0.2 | 0.3 |
| RAIL | 15 | SJV | SJU | NOFAC | SOX | 0.1 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| RAIL | 15 | SJV | SJU | YARD | DPM | 0.01 | 0.01 | 0.01 |
| RAIL | 15 | SJV | SJU | YARD | NOX | 0.8 | 0.7 | 0.6 |
| RAIL | 15 | SJV | SJU | YARD | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 15 | SJV | SJU | YARD | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 16 | SJV | SJU | NOFAC | DPM | 0.03 | 0.03 | 0.03 |
| RAIL | 16 | SJV | SJU | NOFAC | NOX | 1.4 | 0.9 | 1.0 |
| RAIL | 16 | SJV | SJU | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 16 | SJV | SJU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 18 | NEP | LAS | NOFAC | DPM | 0.07 | 0.06 | 0.06 |
| RAIL | 18 | NEP | LAS | NOFAC | NOX | 2.9 | 1.9 | 2.0 |
| RAIL | 18 | NEP | LAS | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 18 | NEP | LAS | NOFAC | SOX | 0.2 | 0.0 | 0.0 |
| RAIL | 19 | MD | AV | NOFAC | DPM | 0.06 | 0.06 | 0.06 |
| RAIL | 19 | MD | AV | NOFAC | NOX | 2.4 | 1.3 | 1.6 |
| RAIL | 19 | MD | AV | NOFAC | ROG | 0.2 | 0.2 | 0.2 |
| RAIL | 19 | MD | AV | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 19 | SC | SC | NOFAC | DPM | 0.34 | 0.31 | 0.32 |
| RAIL | 19 | SC | SC | NOFAC | NOX | 14.9 | 7.3 | 9.6 |
| RAIL | 19 | SC | SC | NOFAC | ROG | 1.0 | 1.0 | 1.0 |
| RAIL | 19 | SC | SC | NOFAC | SOX | 0.6 | 0.1 | 0.0 |
| RAIL | 19 | SC | SC | PORT | DPM | 0.09 | 0.08 | 0.09 |
| RAIL | 19 | SC | SC | PORT | NOX | 4.0 | 2.0 | 2.4 |
| RAIL | 19 | SC | SC | PORT | ROG | 0.2 | 0.1 | 0.1 |
| RAIL | 19 | SC | SC | PORT | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 19 | SC | SC | YARD | DPM | 0.09 | 0.07 | 0.08 |
| RAIL | 19 | SC | SC | YARD | NOx | 3.9 | 1.9 | 2.3 |
| RAIL | 19 | SC | SC | YARD | ROG | 0.3 | 0.2 | 0.2 |
| RAIL | 19 | SC | SC | YARD | SOx | 0.0 | 0.0 | 0.0 |
| RAIL | 20 | SJV | SJU | NOFAC | DPM | 0.04 | 0.03 | 0.03 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| RAIL | 20 | SJV | SJU | NOFAC | NOX | 1.6 | 1.0 | 1.1 |
| RAIL | 20 | SJV | SJU | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 20 | SJV | SJU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 21 | SF | BA | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 21 | SF | BA | NOFAC | NOX | 0.2 | 0.1 | 0.1 |
| RAIL | 21 | SF | BA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 21 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 23 | NC | MEN | NOFAC | DPM | 0.05 | 0.05 | 0.05 |
| RAIL | 23 | NC | MEN | NOFAC | NOX | 0.7 | 0.5 | 0.5 |
| RAIL | 23 | NC | MEN | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 23 | NC | MEN | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 24 | SJV | SJU | NOFAC | DPM | 0.06 | 0.05 | 0.05 |
| RAIL | 24 | SJV | SJU | NOFAC | NOX | 2.6 | 1.7 | 1.8 |
| RAIL | 24 | SJV | SJU | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 24 | SJV | SJU | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 25 | NEP | MOD | NOFAC | DPM | 0.06 | 0.05 | 0.05 |
| RAIL | 25 | NEP | MOD | NOFAC | NOX | 2.6 | 1.7 | 1.8 |
| RAIL | 25 | NEP | MOD | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 25 | NEP | MOD | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 27 | NCC | MBU | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 27 | NCC | MBU | NOFAC | NOX | 0.0 | 0.0 | 0.0 |
| RAIL | 27 | NCC | MBU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 27 | NCC | MBU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 28 | SF | BA | NOFAC | DPM | 0.01 | 0.01 | 0.01 |
| RAIL | 28 | SF | BA | NOFAC | NOX | 0.6 | 0.4 | 0.4 |
| RAIL | 28 | SF | BA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 28 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 29 | MC | NSI | NOFAC | DPM | 0.02 | 0.01 | 0.01 |
| RAIL | 29 | MC | NSI | NOFAC | NOX | 0.7 | 0.4 | 0.5 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| RAIL | 29 | MC | NSI | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 29 | MC | NSI | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 29 | MC | NSI | YARD | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 29 | MC | NSI | YARD | NOX | 0.0 | 0.0 | 0.0 |
| RAIL | 29 | MC | NSI | YARD | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 29 | MC | NSI | YARD | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 30 | SC | SC | NOFAC | DPM | 0.12 | 0.11 | 0.12 |
| RAIL | 30 | SC | SC | NOFAC | NOX | 5.2 | 2.6 | 3.6 |
| RAIL | 30 | SC | SC | NOFAC | ROG | 0.3 | 0.3 | 0.3 |
| RAIL | 30 | SC | SC | NOFAC | SOX | 0.2 | 0.0 | 0.0 |
| RAIL | 31 | MC | PLA | NOFAC | DPM | 0.03 | 0.03 | 0.03 |
| RAIL | 31 | MC | PLA | NOFAC | NOX | 1.4 | 0.9 | 1.0 |
| RAIL | 31 | MC | PLA | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 31 | MC | PLA | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 31 | SV | PLA | NOFAC | DPM | 0.04 | 0.04 | 0.04 |
| RAIL | 31 | SV | PLA | NOFAC | NOX | 2.0 | 1.3 | 1.5 |
| RAIL | 31 | SV | PLA | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 31 | SV | PLA | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 31 | SV | PLA | YARD | DPM | 0.02 | 0.02 | 0.02 |
| RAIL | 31 | SV | PLA | YARD | NOx | 0.9 | 0.5 | 0.6 |
| RAIL | 31 | SV | PLA | YARD | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 31 | SV | PLA | YARD | SOx | 0.0 | 0.0 | 0.0 |
| RAIL | 32 | MC | NSI | NOFAC | DPM | 0.07 | 0.06 | 0.06 |
| RAIL | 32 | MC | NSI | NOFAC | NOX | 3.0 | 2.0 | 2.2 |
| RAIL | 32 | MC | NSI | NOFAC | ROG | 0.2 | 0.1 | 0.2 |
| RAIL | 32 | MC | NSI | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 32 | MC | NSI | YARD | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 32 | MC | NSI | YARD | NOX | 0.0 | 0.0 | 0.0 |
| RAIL | 32 | MC | NSI | YARD | ROG | 0.0 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| RAIL | 32 | MC | NSI | YARD | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 33 | MD | MOJ | NOFAC | DPM | 0.06 | 0.06 | 0.06 |
| RAIL | 33 | MD | MOJ | NOFAC | NOX | 2.3 | 1.2 | 1.6 |
| RAIL | 33 | MD | MOJ | NOFAC | ROG | 0.2 | 0.2 | 0.2 |
| RAIL | 33 | MD | MOJ | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 33 | MD | SC | NOFAC | DPM | 0.03 | 0.02 | 0.03 |
| RAIL | 33 | MD | SC | NOFAC | NOX | 1.0 | 0.6 | 0.7 |
| RAIL | 33 | MD | SC | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 33 | MD | SC | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 33 | SC | SC | NOFAC | DPM | 0.10 | 0.09 | 0.10 |
| RAIL | 33 | SC | SC | NOFAC | NOX | 4.3 | 2.1 | 2.8 |
| RAIL | 33 | SC | SC | NOFAC | ROG | 0.3 | 0.3 | 0.3 |
| RAIL | 33 | SC | SC | NOFAC | SOX | 0.2 | 0.0 | 0.0 |
| RAIL | 33 | SC | SC | YARD | DPM | 0.01 | 0.01 | 0.01 |
| RAIL | 33 | SC | SC | YARD | NOx | 0.6 | 0.3 | 0.4 |
| RAIL | 33 | SC | SC | YARD | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 33 | SC | SC | YARD | SOx | 0.0 | 0.0 | 0.0 |
| RAIL | 33 | SS | SC | NOFAC | DPM | 0.09 | 0.09 | 0.09 |
| RAIL | 33 | SS | SC | NOFAC | NOX | 3.6 | 1.9 | 2.4 |
| RAIL | 33 | SS | SC | NOFAC | ROG | 0.3 | 0.2 | 0.3 |
| RAIL | 33 | SS | SC | NOFAC | SOX | 0.2 | 0.0 | 0.0 |
| RAIL | 34 | SV | SAC | NOFAC | DPM | 0.07 | 0.07 | 0.07 |
| RAIL | 34 | SV | SAC | NOFAC | NOX | 3.5 | 2.3 | 2.6 |
| RAIL | 34 | SV | SAC | NOFAC | ROG | 0.2 | 0.1 | 0.2 |
| RAIL | 34 | SV | SAC | NOFAC | SOX | 0.2 | 0.0 | 0.0 |
| RAIL | 34 | SV | SAC | YARD | DPM | 0.04 | 0.03 | 0.04 |
| RAIL | 34 | SV | SAC | YARD | NOx | 1.9 | 1.1 | 1.2 |
| RAIL | 34 | SV | SAC | YARD | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 34 | SV | SAC | YARD | SOx | 0.0 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| RAIL | 35 | NCC | MBU | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 35 | NCC | MBU | NOFAC | NOX | 0.0 | 0.0 | 0.0 |
| RAIL | 35 | NCC | MBU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 35 | NCC | MBU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 36 | MD | MOJ | NOFAC | DPM | 0.82 | 0.76 | 0.82 |
| RAIL | 36 | MD | MOJ | NOFAC | NOX | 31.7 | 17.0 | 21.3 |
| RAIL | 36 | MD | MOJ | NOFAC | ROG | 2.2 | 2.2 | 2.4 |
| RAIL | 36 | MD | MOJ | NOFAC | SOX | 1.9 | 0.2 | 0.0 |
| RAIL | 36 | MD | MOJ | YARD | DPM | 0.09 | 0.07 | 0.07 |
| RAIL | 36 | MD | MOJ | YARD | NOx | 3.7 | 1.9 | 2.2 |
| RAIL | 36 | MD | MOJ | YARD | ROG | 0.3 | 0.2 | 0.2 |
| RAIL | 36 | MD | MOJ | YARD | SOx | 0.0 | 0.0 | 0.0 |
| RAIL | 36 | SC | SC | NOFAC | DPM | 0.11 | 0.10 | 0.11 |
| RAIL | 36 | SC | SC | NOFAC | NOX | 4.8 | 2.4 | 3.1 |
| RAIL | 36 | SC | SC | NOFAC | ROG | 0.3 | 0.3 | 0.3 |
| RAIL | 36 | SC | SC | NOFAC | SOX | 0.2 | 0.0 | 0.0 |
| RAIL | 36 | SC | SC | YARD | DPM | 0.11 | 0.09 | 0.09 |
| RAIL | 36 | SC | SC | YARD | NOx | 4.8 | 2.2 | 2.8 |
| RAIL | 36 | SC | SC | YARD | ROG | 0.3 | 0.3 | 0.3 |
| RAIL | 36 | SC | SC | YARD | SOx | 0.0 | 0.0 | 0.0 |
| RAIL | 37 | SD | SD | NOFAC | DPM | 0.02 | 0.03 | 0.03 |
| RAIL | 37 | SD | SD | NOFAC | NOX | 1.2 | 1.0 | 1.7 |
| RAIL | 37 | SD | SD | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 37 | SD | SD | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 37 | SD | SD | YARD | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 37 | SD | SD | YARD | NOx | 0.2 | 0.1 | 0.2 |
| RAIL | 37 | SD | SD | YARD | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 37 | SD | SD | YARD | SOx | 0.0 | 0.0 | 0.0 |
| RAIL | 38 | SF | BA | NOFAC | DPM | 0.03 | 0.03 | 0.03 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| RAIL | 38 | SF | BA | NOFAC | NOX | 1.5 | 1.0 | 1.5 |
| RAIL | 38 | SF | BA | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 38 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 38 | SF | BA | PORT | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 38 | SF | BA | PORT | NOX | 0.0 | 0.0 | 0.0 |
| RAIL | 38 | SF | BA | PORT | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 38 | SF | BA | PORT | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 39 | SJV | SJU | NOFAC | DPM | 0.11 | 0.10 | 0.10 |
| RAIL | 39 | SJV | SJU | NOFAC | NOX | 5.3 | 3.5 | 3.8 |
| RAIL | 39 | SJV | SJU | NOFAC | ROG | 0.3 | 0.3 | 0.3 |
| RAIL | 39 | SJV | SJU | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 39 | SJV | SJU | PORT | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 39 | SJV | SJU | PORT | NOX | 0.0 | 0.0 | 0.0 |
| RAIL | 39 | SJV | SJU | PORT | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 39 | SJV | SJU | PORT | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 39 | SJV | SJU | YARD | DPM | 0.01 | 0.01 | 0.01 |
| RAIL | 39 | SJV | SJU | YARD | NOx | 0.6 | 0.4 | 0.4 |
| RAIL | 39 | SJV | SJU | YARD | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 39 | SJV | SJU | YARD | SOx | 0.0 | 0.0 | 0.0 |
| RAIL | 40 | SCC | SLO | NOFAC | DPM | 0.04 | 0.04 | 0.04 |
| RAIL | 40 | SCC | SLO | NOFAC | NOX | 2.0 | 1.0 | 1.1 |
| RAIL | 40 | SCC | SLO | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 40 | SCC | SLO | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 41 | SF | BA | NOFAC | DPM | 0.03 | 0.02 | 0.02 |
| RAIL | 41 | SF | BA | NOFAC | NOX | 1.3 | 0.9 | 1.2 |
| RAIL | 41 | SF | BA | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 41 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 41 | SF | BA | PORT | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 41 | SF | BA | PORT | NOX | 0.0 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| RAIL | 41 | SF | BA | PORT | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 41 | SF | BA | PORT | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 42 | SCC | SB | NOFAC | DPM | 0.09 | 0.08 | 0.08 |
| RAIL | 42 | SCC | SB | NOFAC | NOX | 4.5 | 2.1 | 2.4 |
| RAIL | 42 | SCC | SB | NOFAC | ROG | 0.2 | 0.2 | 0.2 |
| RAIL | 42 | SCC | SB | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 43 | SF | BA | NOFAC | DPM | 0.06 | 0.06 | 0.06 |
| RAIL | 43 | SF | BA | NOFAC | NOX | 3.1 | 2.0 | 2.6 |
| RAIL | 43 | SF | BA | NOFAC | ROG | 0.2 | 0.2 | 0.2 |
| RAIL | 43 | SF | BA | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 43 | SF | BA | YARD | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 43 | SF | BA | YARD | NOX | 0.2 | 0.1 | 0.1 |
| RAIL | 43 | SF | BA | YARD | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 43 | SF | BA | YARD | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 44 | NCC | MBU | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 44 | NCC | MBU | NOFAC | NOX | 0.0 | 0.0 | 0.0 |
| RAIL | 44 | NCC | MBU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 44 | NCC | MBU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 45 | SV | SHA | NOFAC | DPM | 0.08 | 0.07 | 0.07 |
| RAIL | 45 | SV | SHA | NOFAC | NOX | 3.6 | 2.3 | 2.6 |
| RAIL | 45 | SV | SHA | NOFAC | ROG | 0.2 | 0.2 | 0.2 |
| RAIL | 45 | SV | SHA | NOFAC | SOX | 0.2 | 0.0 | 0.0 |
| RAIL | 46 | MC | NSI | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 46 | MC | NSI | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| RAIL | 46 | MC | NSI | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 46 | MC | NSI | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 47 | NEP | SIS | NOFAC | DPM | 0.09 | 0.08 | 0.08 |
| RAIL | 47 | NEP | SIS | NOFAC | NOX | 4.0 | 2.6 | 2.8 |
| RAIL | 47 | NEP | SIS | NOFAC | ROG | 0.2 | 0.2 | 0.2 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| RAIL | 47 | NEP | SIS | NOFAC | SOX | 0.2 | 0.0 | 0.0 |
| RAIL | 48 | SF | BA | NOFAC | DPM | 0.02 | 0.02 | 0.02 |
| RAIL | 48 | SF | BA | NOFAC | NOX | 0.8 | 0.6 | 0.6 |
| RAIL | 48 | SF | BA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 48 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 48 | SV | YS | NOFAC | DPM | 0.02 | 0.02 | 0.02 |
| RAIL | 48 | SV | YS | NOFAC | NOX | 1.0 | 0.6 | 0.8 |
| RAIL | 48 | SV | YS | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 48 | SV | YS | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 49 | NC | NS | NOFAC | DPM | 0.01 | 0.01 | 0.01 |
| RAIL | 49 | NC | NS | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| RAIL | 49 | NC | NS | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 49 | NC | NS | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 49 | SF | BA | NOFAC | DPM | 0.01 | 0.01 | 0.01 |
| RAIL | 49 | SF | BA | NOFAC | NOX | 0.7 | 0.5 | 0.5 |
| RAIL | 49 | SF | BA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 49 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 50 | SJV | SJU | NOFAC | DPM | 0.07 | 0.06 | 0.06 |
| RAIL | 50 | SJV | SJU | NOFAC | NOX | 3.1 | 2.0 | 2.1 |
| RAIL | 50 | SJV | SJU | NOFAC | ROG | 0.2 | 0.1 | 0.1 |
| RAIL | 50 | SJV | SJU | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 51 | SV | FR | NOFAC | DPM | 0.02 | 0.02 | 0.02 |
| RAIL | 51 | SV | FR | NOFAC | NOX | 0.9 | 0.6 | 0.7 |
| RAIL | 51 | SV | FR | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 51 | SV | FR | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 52 | SV | TEH | NOFAC | DPM | 0.04 | 0.04 | 0.04 |
| RAIL | 52 | SV | TEH | NOFAC | NOX | 2.0 | 1.3 | 1.4 |
| RAIL | 52 | SV | TEH | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 52 | SV | TEH | NOFAC | SOX | 0.1 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| RAIL | 53 | NC | NCU | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 53 | NC | NCU | NOFAC | NOX | 0.1 | 0.0 | 0.0 |
| RAIL | 53 | NC | NCU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 53 | NC | NCU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 54 | SJV | SJU | NOFAC | DPM | 0.10 | 0.09 | 0.09 |
| RAIL | 54 | SJV | SJU | NOFAC | NOX | 4.5 | 2.8 | 3.1 |
| RAIL | 54 | SJV | SJU | NOFAC | ROG | 0.2 | 0.2 | 0.2 |
| RAIL | 54 | SJV | SJU | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 55 | MC | TUO | NOFAC | DPM | 0.01 | 0.01 | 0.01 |
| RAIL | 55 | MC | TUO | NOFAC | NOX | 0.5 | 0.3 | 0.4 |
| RAIL | 55 | MC | TUO | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 55 | MC | TUO | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 56 | SCC | VEN | NOFAC | DPM | 0.05 | 0.05 | 0.04 |
| RAIL | 56 | SCC | VEN | NOFAC | NOX | 2.6 | 1.2 | 1.4 |
| RAIL | 56 | SCC | VEN | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 56 | SCC | VEN | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 56 | SCC | VEN | PORT | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 56 | SCC | VEN | PORT | NOX | 0.0 | 0.0 | 0.0 |
| RAIL | 56 | SCC | VEN | PORT | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 56 | SCC | VEN | PORT | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 57 | SV | YS | NOFAC | DPM | 0.06 | 0.05 | 0.05 |
| RAIL | 57 | SV | YS | NOFAC | NOX | 2.6 | 1.7 | 2.0 |
| RAIL | 57 | SV | YS | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 57 | SV | YS | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| RAIL | 57 | SV | YS | PORT | DPM | 0.00 | 0.00 | 0.00 |
| RAIL | 57 | SV | YS | PORT | NOX | 0.0 | 0.0 | 0.0 |
| RAIL | 57 | SV | YS | PORT | ROG | 0.0 | 0.0 | 0.0 |
| RAIL | 57 | SV | YS | PORT | SOX | 0.0 | 0.0 | 0.0 |
| RAIL | 58 | SV | FR | NOFAC | DPM | 0.04 | 0.03 | 0.03 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| RAIL | 58 | SV | FR | NOFAC | NOX | 1.7 | 1.1 | 1.2 |
| RAIL | 58 | SV | FR | NOFAC | ROG | 0.1 | 0.1 | 0.1 |
| RAIL | 58 | SV | FR | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 1 | SF | BA | NOFAC | DPM | 1.11 | 0.54 | 0.16 |
| TRK | 1 | SF | BA | NOFAC | NOX | 21.5 | 16.2 | 7.3 |
| TRK | 1 | SF | BA | NOFAC | ROG | 1.8 | 1.3 | 0.7 |
| TRK | 1 | SF | BA | NOFAC | SOX | 0.2 | 0.0 | 0.0 |
| TRK | 1 | SF | BA | PORT | DPM | 0.02 | 0.01 | 0.00 |
| TRK | 1 | SF | BA | PORT | NOX | 0.6 | 0.5 | 0.3 |
| TRK | 1 | SF | BA | PORT | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 1 | SF | BA | PORT | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 1 | SF | BA | YARD | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 1 | SF | BA | YARD | NOX | 0.0 | 0.0 | 0.0 |
| TRK | 1 | SF | BA | YARD | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 1 | SF | BA | YARD | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 3 | MC | AMA | NOFAC | DPM | 0.01 | 0.00 | 0.00 |
| TRK | 3 | MC | AMA | NOFAC | NOX | 0.2 | 0.2 | 0.1 |
| TRK | 3 | MC | AMA | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRK | 3 | MC | AMA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 4 | SV | BUT | NOFAC | DPM | 0.27 | 0.19 | 0.06 |
| TRK | 4 | SV | BUT | NOFAC | NOX | 5.1 | 5.4 | 2.7 |
| TRK | 4 | SV | BUT | NOFAC | ROG | 0.4 | 0.4 | 0.2 |
| TRK | 4 | SV | BUT | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 5 | MC | CAL | NOFAC | DPM | 0.03 | 0.01 | 0.00 |
| TRK | 5 | MC | CAL | NOFAC | NOX | 0.5 | 0.4 | 0.2 |
| TRK | 5 | MC | CAL | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRK | 5 | MC | CAL | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 6 | SV | COL | NOFAC | DPM | 0.17 | 0.07 | 0.03 |
| TRK | 6 | SV | COL | NOFAC | NOX | 3.0 | 2.1 | 1.2 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRK | 6 | SV | COL | NOFAC | ROG | 0.2 | 0.2 | 0.1 |
| TRK | 6 | SV | COL | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 7 | SF | BA | NOFAC | DPM | 0.41 | 0.20 | 0.06 |
| TRK | 7 | SF | BA | NOFAC | NOX | 8.3 | 6.2 | 2.8 |
| TRK | 7 | SF | BA | NOFAC | ROG | 0.8 | 0.6 | 0.3 |
| TRK | 7 | SF | BA | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 7 | SF | BA | PORT | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 7 | SF | BA | PORT | NOX | 0.1 | 0.1 | 0.0 |
| TRK | 7 | SF | BA | PORT | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 7 | SF | BA | PORT | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 7 | SF | BA | YARD | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 7 | SF | BA | YARD | NOX | 0.0 | 0.0 | 0.0 |
| TRK | 7 | SF | BA | YARD | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 7 | SF | BA | YARD | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 9 | MC | ED | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 9 | MC | ED | NOFAC | NOX | 0.2 | 0.1 | 0.1 |
| TRK | 9 | MC | ED | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRK | 9 | MC | ED | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 10 | SJV | SJU | NOFAC | DPM | 1.72 | 0.85 | 0.26 |
| TRK | 10 | SJV | SJU | NOFAC | NOX | 31.7 | 24.7 | 12.0 |
| TRK | 10 | SJV | SJU | NOFAC | ROG | 2.5 | 1.9 | 1.1 |
| TRK | 10 | SJV | SJU | NOFAC | SOX | 0.3 | 0.0 | 0.0 |
| TRK | 10 | SJV | SJU | YARD | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 10 | SJV | SJU | YARD | NOX | 0.0 | 0.0 | 0.0 |
| TRK | 10 | SJV | SJU | YARD | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 10 | SJV | SJU | YARD | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 11 | SV | GLE | NOFAC | DPM | 0.13 | 0.06 | 0.02 |
| TRK | 11 | SV | GLE | NOFAC | NOX | 2.4 | 1.7 | 0.9 |
| TRK | 11 | SV | GLE | NOFAC | ROG | 0.2 | 0.1 | 0.1 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRK | 11 | SV | GLE | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 12 | NC | NCU | PORT | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 12 | NC | NCU | PORT | NOX | 0.0 | 0.0 | 0.0 |
| TRK | 12 | NC | NCU | PORT | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 12 | NC | NCU | PORT | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 13 | SS | IMP | NOFAC | DPM | 0.87 | 0.40 | 0.16 |
| TRK | 13 | SS | IMP | NOFAC | NOX | 12.7 | 9.7 | 6.2 |
| TRK | 13 | SS | IMP | NOFAC | ROG | 1.2 | 0.9 | 0.7 |
| TRK | 13 | SS | IMP | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 15 | MD | KER | NOFAC | DPM | 0.92 | 0.43 | 0.14 |
| TRK | 15 | MD | KER | NOFAC | NOX | 15.9 | 11.7 | 5.7 |
| TRK | 15 | MD | KER | NOFAC | ROG | 1.3 | 0.9 | 0.5 |
| TRK | 15 | MD | KER | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 15 | SJV | SJU | NOFAC | DPM | 3.70 | 1.70 | 0.53 |
| TRK | 15 | SJV | SJU | NOFAC | NOX | 67.8 | 47.6 | 22.8 |
| TRK | 15 | SJV | SJU | NOFAC | ROG | 5.0 | 3.5 | 2.0 |
| TRK | 15 | SJV | SJU | NOFAC | SOX | 0.5 | 0.1 | 0.1 |
| TRK | 16 | SJV | SJU | NOFAC | DPM | 0.72 | 0.35 | 0.11 |
| TRK | 16 | SJV | SJU | NOFAC | NOX | 13.0 | 10.0 | 4.9 |
| TRK | 16 | SJV | SJU | NOFAC | ROG | 1.0 | 0.8 | 0.4 |
| TRK | 16 | SJV | SJU | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 18 | NEP | LAS | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 18 | NEP | LAS | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| TRK | 18 | NEP | LAS | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRK | 18 | NEP | LAS | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 19 | MD | AV | NOFAC | DPM | 0.36 | 0.17 | 0.05 |
| TRK | 19 | MD | AV | NOFAC | NOX | 6.2 | 4.7 | 1.9 |
| TRK | 19 | MD | AV | NOFAC | ROG | 0.4 | 0.3 | 0.1 |
| TRK | 19 | MD | AV | NOFAC | SOX | 0.0 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRK | 19 | SC | SC | NOFAC | DPM | 4.45 | 2.58 | 0.78 |
| TRK | 19 | SC | SC | NOFAC | NOX | 74.9 | 66.9 | 30.8 |
| TRK | 19 | SC | SC | NOFAC | ROG | 6.3 | 5.4 | 2.8 |
| TRK | 19 | SC | SC | NOFAC | SOX | 0.5 | 0.1 | 0.1 |
| TRK | 19 | SC | SC | PORT | DPM | 0.12 | 0.07 | 0.02 |
| TRK | 19 | SC | SC | PORT | NOX | 3.9 | 4.1 | 2.9 |
| TRK | 19 | SC | SC | PORT | ROG | 0.2 | 0.2 | 0.1 |
| TRK | 19 | SC | SC | PORT | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 19 | SC | SC | YARD | DPM | 0.02 | 0.01 | 0.00 |
| TRK | 19 | SC | SC | YARD | NOX | 0.6 | 0.6 | 0.4 |
| TRK | 19 | SC | SC | YARD | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 19 | SC | SC | YARD | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 20 | SJV | SJU | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 20 | SJV | SJU | NOFAC | NOX | 0.3 | 0.2 | 0.1 |
| TRK | 20 | SJV | SJU | NOFAC | ROG | 0.1 | 0.1 | 0.0 |
| TRK | 20 | SJV | SJU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 21 | SF | BA | NOFAC | DPM | 0.06 | 0.03 | 0.01 |
| TRK | 21 | SF | BA | NOFAC | NOX | 1.3 | 1.0 | 0.4 |
| TRK | 21 | SF | BA | NOFAC | ROG | 0.2 | 0.1 | 0.1 |
| TRK | 21 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 22 | MC | MPA | NOFAC | NOX | 0.0 | 0.0 | 0.0 |
| TRK | 22 | MC | MPA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 24 | SJV | SJU | NOFAC | DPM | 1.44 | 0.65 | 0.20 |
| TRK | 24 | SJV | SJU | NOFAC | NOX | 23.9 | 16.8 | 8.0 |
| TRK | 24 | SJV | SJU | NOFAC | ROG | 2.1 | 1.4 | 0.7 |
| TRK | 24 | SJV | SJU | NOFAC | SOX | 0.2 | 0.0 | 0.0 |
| TRK | 25 | NEP | MOD | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 25 | NEP | MOD | NOFAC | NOX | 0.1 | 0.1 | 0.0 |
| TRK | 25 | NEP | MOD | NOFAC | ROG | 0.0 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRK | 25 | NEP | MOD | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 27 | NCC | MBU | NOFAC | DPM | 0.27 | 0.12 | 0.04 |
| TRK | 27 | NCC | MBU | NOFAC | NOX | 5.4 | 3.7 | 1.7 |
| TRK | 27 | NCC | MBU | NOFAC | ROG | 0.6 | 0.4 | 0.2 |
| TRK | 27 | NCC | MBU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 28 | SF | BA | NOFAC | DPM | 0.07 | 0.04 | 0.01 |
| TRK | 28 | SF | BA | NOFAC | NOX | 1.5 | 1.1 | 0.5 |
| TRK | 28 | SF | BA | NOFAC | ROG | 0.2 | 0.1 | 0.0 |
| TRK | 28 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 29 | MC | NSI | NOFAC | DPM | 0.28 | 0.12 | 0.04 |
| TRK | 29 | MC | NSI | NOFAC | NOX | 5.2 | 3.6 | 1.7 |
| TRK | 29 | MC | NSI | NOFAC | ROG | 0.4 | 0.3 | 0.2 |
| TRK | 29 | MC | NSI | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 30 | SC | SC | NOFAC | DPM | 0.80 | 0.49 | 0.15 |
| TRK | 30 | SC | SC | NOFAC | NOX | 14.1 | 13.1 | 6.1 |
| TRK | 30 | SC | SC | NOFAC | ROG | 1.3 | 1.1 | 0.6 |
| TRK | 30 | SC | SC | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 31 | MC | PLA | NOFAC | DPM | 0.33 | 0.15 | 0.05 |
| TRK | 31 | MC | PLA | NOFAC | NOX | 6.0 | 4.4 | 2.2 |
| TRK | 31 | MC | PLA | NOFAC | ROG | 0.5 | 0.3 | 0.2 |
| TRK | 31 | MC | PLA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 31 | SV | PLA | NOFAC | DPM | 0.21 | 0.10 | 0.03 |
| TRK | 31 | SV | PLA | NOFAC | NOX | 3.9 | 2.8 | 1.4 |
| TRK | 31 | SV | PLA | NOFAC | ROG | 0.4 | 0.2 | 0.1 |
| TRK | 31 | SV | PLA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 32 | MC | NSI | NOFAC | DPM | 0.01 | 0.00 | 0.00 |
| TRK | 32 | MC | NSI | NOFAC | NOX | 0.2 | 0.1 | 0.1 |
| TRK | 32 | MC | NSI | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRK | 32 | MC | NSI | NOFAC | SOX | 0.0 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRK | 33 | MD | MOJ | NOFAC | DPM | 0.45 | 0.22 | 0.07 |
| TRK | 33 | MD | MOJ | NOFAC | NOX | 7.7 | 5.9 | 3.2 |
| TRK | 33 | MD | MOJ | NOFAC | ROG | 0.6 | 0.5 | 0.3 |
| TRK | 33 | MD | MOJ | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 33 | MD | SC | NOFAC | DPM | 0.47 | 0.23 | 0.08 |
| TRK | 33 | MD | SC | NOFAC | NOX | 8.1 | 6.2 | 3.4 |
| TRK | 33 | MD | SC | NOFAC | ROG | 0.6 | 0.5 | 0.3 |
| TRK | 33 | MD | SC | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 33 | SC | SC | NOFAC | DPM | 1.55 | 0.84 | 0.32 |
| TRK | 33 | SC | SC | NOFAC | NOX | 25.3 | 21.0 | 11.9 |
| TRK | 33 | SC | SC | NOFAC | ROG | 2.0 | 1.6 | 1.0 |
| TRK | 33 | SC | SC | NOFAC | SOX | 0.2 | 0.0 | 0.0 |
| TRK | 33 | SS | SC | NOFAC | DPM | 1.83 | 1.07 | 0.35 |
| TRK | 33 | SS | SC | NOFAC | NOX | 26.7 | 24.3 | 12.0 |
| TRK | 33 | SS | SC | NOFAC | ROG | 1.9 | 1.8 | 1.0 |
| TRK | 33 | SS | SC | NOFAC | SOX | 0.2 | 0.0 | 0.0 |
| TRK | 34 | SV | SAC | NOFAC | DPM | 0.71 | 0.40 | 0.12 |
| TRK | 34 | SV | SAC | NOFAC | NOX | 13.9 | 11.7 | 5.6 |
| TRK | 34 | SV | SAC | NOFAC | ROG | 1.5 | 1.1 | 0.6 |
| TRK | 34 | SV | SAC | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 35 | NCC | MBU | NOFAC | DPM | 0.36 | 0.16 | 0.05 |
| TRK | 35 | NCC | MBU | NOFAC | NOX | 6.7 | 4.8 | 2.2 |
| TRK | 35 | NCC | MBU | NOFAC | ROG | 0.5 | 0.3 | 0.2 |
| TRK | 35 | NCC | MBU | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 36 | MD | MOJ | NOFAC | DPM | 4.67 | 2.60 | 0.75 |
| TRK | 36 | MD | MOJ | NOFAC | NOX | 66.9 | 56.5 | 25.1 |
| TRK | 36 | MD | MOJ | NOFAC | ROG | 6.2 | 5.5 | 2.6 |
| TRK | 36 | MD | MOJ | NOFAC | SOX | 0.5 | 0.1 | 0.1 |
| TRK | 36 | SC | SC | NOFAC | DPM | 1.27 | 0.64 | 0.22 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRK | 36 | SC | SC | NOFAC | NOX | 20.9 | 16.3 | 8.3 |
| TRK | 36 | SC | SC | NOFAC | ROG | 1.6 | 1.2 | 0.7 |
| TRK | 36 | SC | SC | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 36 | SC | SC | YARD | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 36 | SC | SC | YARD | NOX | 0.1 | 0.0 | 0.0 |
| TRK | 36 | SC | SC | YARD | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 36 | SC | SC | YARD | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 37 | SD | SD | NOFAC | DPM | 1.47 | 0.74 | 0.37 |
| TRK | 37 | SD | SD | NOFAC | NOX | 25.9 | 21.0 | 13.9 |
| TRK | 37 | SD | SD | NOFAC | ROG | 2.5 | 1.8 | 1.1 |
| TRK | 37 | SD | SD | NOFAC | SOX | 0.2 | 0.0 | 0.0 |
| TRK | 37 | SD | SD | PORT | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 37 | SD | SD | PORT | NOX | 0.1 | 0.1 | 0.1 |
| TRK | 37 | SD | SD | PORT | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 37 | SD | SD | PORT | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 38 | SF | BA | NOFAC | DPM | 0.02 | 0.02 | 0.01 |
| TRK | 38 | SF | BA | NOFAC | NOX | 0.8 | 0.6 | 0.3 |
| TRK | 38 | SF | BA | NOFAC | ROG | 0.2 | 0.1 | 0.1 |
| TRK | 38 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 38 | SF | BA | PORT | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 38 | SF | BA | PORT | NOX | 0.0 | 0.0 | 0.0 |
| TRK | 38 | SF | BA | PORT | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 38 | SF | BA | PORT | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 39 | SJV | SJU | NOFAC | DPM | 1.10 | 0.51 | 0.16 |
| TRK | 39 | SJV | SJU | NOFAC | NOX | 20.7 | 14.6 | 7.2 |
| TRK | 39 | SJV | SJU | NOFAC | ROG | 1.7 | 1.1 | 0.6 |
| TRK | 39 | SJV | SJU | NOFAC | SOX | 0.2 | 0.0 | 0.0 |
| TRK | 39 | SJV | SJU | PORT | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 39 | SJV | SJU | PORT | NOX | 0.1 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRK | 39 | SJV | SJU | PORT | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 39 | SJV | SJU | PORT | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 39 | SJV | SJU | YARD | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 39 | SJV | SJU | YARD | NOX | 0.1 | 0.1 | 0.0 |
| TRK | 39 | SJV | SJU | YARD | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 39 | SJV | SJU | YARD | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 40 | SCC | SLO | NOFAC | DPM | 0.12 | 0.06 | 0.02 |
| TRK | 40 | SCC | SLO | NOFAC | NOX | 2.5 | 1.8 | 0.9 |
| TRK | 40 | SCC | SLO | NOFAC | ROG | 0.3 | 0.2 | 0.1 |
| TRK | 40 | SCC | SLO | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 41 | SF | BA | NOFAC | DPM | 0.05 | 0.02 | 0.01 |
| TRK | 41 | SF | BA | NOFAC | NOX | 1.3 | 0.9 | 0.4 |
| TRK | 41 | SF | BA | NOFAC | ROG | 0.2 | 0.1 | 0.1 |
| TRK | 41 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 41 | SF | BA | PORT | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 41 | SF | BA | PORT | NOX | 0.0 | 0.0 | 0.0 |
| TRK | 41 | SF | BA | PORT | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 41 | SF | BA | PORT | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 42 | SCC | SB | NOFAC | DPM | 0.12 | 0.06 | 0.02 |
| TRK | 42 | SCC | SB | NOFAC | NOX | 3.1 | 2.0 | 0.9 |
| TRK | 42 | SCC | SB | NOFAC | ROG | 0.4 | 0.3 | 0.2 |
| TRK | 42 | SCC | SB | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 43 | SF | BA | NOFAC | DPM | 0.59 | 0.34 | 0.11 |
| TRK | 43 | SF | BA | NOFAC | NOX | 11.8 | 10.1 | 4.8 |
| TRK | 43 | SF | BA | NOFAC | ROG | 1.2 | 0.9 | 0.5 |
| TRK | 43 | SF | BA | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 44 | NCC | MBU | NOFAC | DPM | 0.03 | 0.02 | 0.00 |
| TRK | 44 | NCC | MBU | NOFAC | NOX | 0.7 | 0.6 | 0.3 |
| TRK | 44 | NCC | MBU | NOFAC | ROG | 0.1 | 0.1 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRK | 44 | NCC | MBU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 45 | SV | SHA | NOFAC | DPM | 0.66 | 0.29 | 0.09 |
| TRK | 45 | SV | SHA | NOFAC | NOX | 11.0 | 7.8 | 3.8 |
| TRK | 45 | SV | SHA | NOFAC | ROG | 1.0 | 0.6 | 0.4 |
| TRK | 45 | SV | SHA | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 46 | MC | NSI | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 46 | MC | NSI | NOFAC | NOX | 0.1 | 0.1 | 0.0 |
| TRK | 46 | MC | NSI | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 46 | MC | NSI | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 47 | NEP | SIS | NOFAC | DPM | 0.54 | 0.22 | 0.07 |
| TRK | 47 | NEP | SIS | NOFAC | NOX | 9.7 | 6.0 | 2.9 |
| TRK | 47 | NEP | SIS | NOFAC | ROG | 0.8 | 0.5 | 0.2 |
| TRK | 47 | NEP | SIS | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 48 | SF | BA | NOFAC | DPM | 0.15 | 0.07 | 0.02 |
| TRK | 48 | SF | BA | NOFAC | NOX | 3.3 | 2.2 | 1.0 |
| TRK | 48 | SF | BA | NOFAC | ROG | 0.3 | 0.2 | 0.1 |
| TRK | 48 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 48 | SV | YS | NOFAC | DPM | 0.24 | 0.11 | 0.03 |
| TRK | 48 | SV | YS | NOFAC | NOX | 4.4 | 3.1 | 1.5 |
| TRK | 48 | SV | YS | NOFAC | ROG | 0.3 | 0.2 | 0.1 |
| TRK | 48 | SV | YS | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 49 | SF | BA | NOFAC | DPM | 0.06 | 0.03 | 0.01 |
| TRK | 49 | SF | BA | NOFAC | NOX | 1.5 | 1.1 | 0.5 |
| TRK | 49 | SF | BA | NOFAC | ROG | 0.2 | 0.1 | 0.1 |
| TRK | 49 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 50 | SJV | SJU | NOFAC | DPM | 0.74 | 0.38 | 0.12 |
| TRK | 50 | SJV | SJU | NOFAC | NOX | 14.1 | 11.3 | 5.5 |
| TRK | 50 | SJV | SJU | NOFAC | ROG | 1.1 | 0.8 | 0.5 |
| TRK | 50 | SJV | SJU | NOFAC | SOX | 0.1 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRK | 51 | SV | FR | NOFAC | DPM | 0.30 | 0.14 | 0.05 |
| TRK | 51 | SV | FR | NOFAC | NOX | 5.5 | 4.2 | 2.1 |
| TRK | 51 | SV | FR | NOFAC | ROG | 0.4 | 0.3 | 0.2 |
| TRK | 51 | SV | FR | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 52 | SV | TEH | NOFAC | DPM | 0.50 | 0.22 | 0.07 |
| TRK | 52 | SV | TEH | NOFAC | NOX | 8.8 | 5.9 | 3.0 |
| TRK | 52 | SV | TEH | NOFAC | ROG | 0.7 | 0.5 | 0.3 |
| TRK | 52 | SV | TEH | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 54 | SJV | SJU | NOFAC | DPM | 0.60 | 0.32 | 0.10 |
| TRK | 54 | SJV | SJU | NOFAC | NOX | 11.6 | 9.7 | 4.8 |
| TRK | 54 | SJV | SJU | NOFAC | ROG | 0.9 | 0.7 | 0.4 |
| TRK | 54 | SJV | SJU | NOFAC | SOX | 0.1 | 0.0 | 0.0 |
| TRK | 55 | MC | TUO | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 55 | MC | TUO | NOFAC | NOX | 0.1 | 0.1 | 0.0 |
| TRK | 55 | MC | TUO | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRK | 55 | MC | TUO | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 56 | SCC | VEN | NOFAC | DPM | 0.24 | 0.12 | 0.04 |
| TRK | 56 | SCC | VEN | NOFAC | NOX | 4.5 | 3.5 | 1.6 |
| TRK | 56 | SCC | VEN | NOFAC | ROG | 0.4 | 0.3 | 0.2 |
| TRK | 56 | SCC | VEN | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 56 | SCC | VEN | PORT | DPM | 0.00 | 0.00 | 0.00 |
| TRK | 56 | SCC | VEN | PORT | NOX | 0.1 | 0.1 | 0.1 |
| TRK | 56 | SCC | VEN | PORT | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 56 | SCC | VEN | PORT | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 57 | SV | YS | NOFAC | DPM | 0.29 | 0.13 | 0.04 |
| TRK | 57 | SV | YS | NOFAC | NOX | 5.5 | 3.6 | 1.8 |
| TRK | 57 | SV | YS | NOFAC | ROG | 0.5 | 0.3 | 0.2 |
| TRK | 57 | SV | YS | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 57 | SV | YS | PORT | DPM | 0.00 | 0.00 | 0.00 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRK | 57 | SV | YS | PORT | NOX | 0.0 | 0.0 | 0.0 |
| TRK | 57 | SV | YS | PORT | ROG | 0.0 | 0.0 | 0.0 |
| TRK | 57 | SV | YS | PORT | SOX | 0.0 | 0.0 | 0.0 |
| TRK | 58 | SV | FR | NOFAC | DPM | 0.02 | 0.01 | 0.00 |
| TRK | 58 | SV | FR | NOFAC | NOX | 0.4 | 0.3 | 0.1 |
| TRK | 58 | SV | FR | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRK | 58 | SV | FR | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 1 | SF | BA | NOFAC | DPM | 0.11 | 0.07 | 0.01 |
| TRU | 1 | SF | BA | NOFAC | NOX | 0.9 | 1.2 | 1.2 |
| TRU | 1 | SF | BA | NOFAC | ROG | 0.6 | 0.3 | 0.2 |
| TRU | 1 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 2 | GBV | GBU | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRU | 2 | GBV | GBU | NOFAC | NOX | 0.0 | 0.0 | 0.0 |
| TRU | 2 | GBV | GBU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 2 | GBV | GBU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 3 | MC | AMA | NOFAC | DPM | 0.01 | 0.00 | 0.00 |
| TRU | 3 | MC | AMA | NOFAC | NOX | 0.0 | 0.1 | 0.1 |
| TRU | 3 | MC | AMA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 3 | MC | AMA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 4 | SV | BUT | NOFAC | DPM | 0.03 | 0.02 | 0.00 |
| TRU | 4 | SV | BUT | NOFAC | NOX | 0.2 | 0.3 | 0.3 |
| TRU | 4 | SV | BUT | NOFAC | ROG | 0.1 | 0.1 | 0.0 |
| TRU | 4 | SV | BUT | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 5 | MC | CAL | NOFAC | DPM | 0.01 | 0.00 | 0.00 |
| TRU | 5 | MC | CAL | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| TRU | 5 | MC | CAL | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 5 | MC | CAL | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 6 | SV | COL | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRU | 6 | SV | COL | NOFAC | NOX | 0.0 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRU | 6 | SV | COL | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 6 | SV | COL | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 7 | SF | BA | NOFAC | DPM | 0.07 | 0.05 | 0.00 |
| TRU | 7 | SF | BA | NOFAC | NOX | 0.6 | 0.8 | 0.8 |
| TRU | 7 | SF | BA | NOFAC | ROG | 0.4 | 0.2 | 0.1 |
| TRU | 7 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 8 | NC | NCU | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRU | 8 | NC | NCU | NOFAC | NOX | 0.0 | 0.0 | 0.0 |
| TRU | 8 | NC | NCU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 8 | NC | NCU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 9 | LT | ED | NOFAC | DPM | 0.01 | 0.00 | 0.00 |
| TRU | 9 | LT | ED | NOFAC | NOX | 0.0 | 0.1 | 0.1 |
| TRU | 9 | LT | ED | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 9 | LT | ED | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 9 | MC | ED | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| TRU | 9 | MC | ED | NOFAC | NOX | 0.1 | 0.2 | 0.2 |
| TRU | 9 | MC | ED | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRU | 9 | MC | ED | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 10 | SJV | SJU | NOFAC | DPM | 0.08 | 0.05 | 0.00 |
| TRU | 10 | SJV | SJU | NOFAC | NOX | 0.6 | 0.8 | 0.8 |
| TRU | 10 | SJV | SJU | NOFAC | ROG | 0.4 | 0.2 | 0.1 |
| TRU | 10 | SJV | SJU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 11 | SV | GLE | NOFAC | DPM | 0.01 | 0.00 | 0.00 |
| TRU | 11 | SV | GLE | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| TRU | 11 | SV | GLE | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 11 | SV | GLE | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 12 | NC | NCU | NOFAC | DPM | 0.02 | 0.01 | 0.00 |
| TRU | 12 | NC | NCU | NOFAC | NOX | 0.2 | 0.2 | 0.2 |
| TRU | 12 | NC | NCU | NOFAC | ROG | 0.1 | 0.1 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRU | 12 | NC | NCU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 13 | SS | IMP | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| TRU | 13 | SS | IMP | NOFAC | NOX | 0.1 | 0.2 | 0.2 |
| TRU | 13 | SS | IMP | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRU | 13 | SS | IMP | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 14 | GBV | GBU | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRU | 14 | GBV | GBU | NOFAC | NOX | 0.0 | 0.0 | 0.0 |
| TRU | 14 | GBV | GBU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 14 | GBV | GBU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 15 | MD | KER | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| TRU | 15 | MD | KER | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| TRU | 15 | MD | KER | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRU | 15 | MD | KER | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 15 | SJV | SJU | NOFAC | DPM | 0.06 | 0.04 | 0.00 |
| TRU | 15 | SJV | SJU | NOFAC | NOX | 0.5 | 0.6 | 0.6 |
| TRU | 15 | SJV | SJU | NOFAC | ROG | 0.3 | 0.2 | 0.1 |
| TRU | 15 | SJV | SJU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 16 | SJV | SJU | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| TRU | 16 | SJV | SJU | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| TRU | 16 | SJV | SJU | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRU | 16 | SJV | SJU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 17 | LC | LAK | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| TRU | 17 | LC | LAK | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| TRU | 17 | LC | LAK | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRU | 17 | LC | LAK | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 18 | NEP | LAS | NOFAC | DPM | 0.01 | 0.00 | 0.00 |
| TRU | 18 | NEP | LAS | NOFAC | NOX | 0.0 | 0.1 | 0.1 |
| TRU | 18 | NEP | LAS | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 18 | NEP | LAS | NOFAC | SOX | 0.0 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRU | 19 | MD | AV | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| TRU | 19 | MD | AV | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| TRU | 19 | MD | AV | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 19 | MD | AV | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 19 | SC | SC | NOFAC | DPM | 0.50 | 0.32 | 0.03 |
| TRU | 19 | SC | SC | NOFAC | NOX | 4.3 | 5.3 | 5.6 |
| TRU | 19 | SC | SC | NOFAC | ROG | 2.5 | 1.4 | 0.8 |
| TRU | 19 | SC | SC | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 20 | SJV | SJU | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| TRU | 20 | SJV | SJU | NOFAC | NOX | 0.1 | 0.1 | 0.2 |
| TRU | 20 | SJV | SJU | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRU | 20 | SJV | SJU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 21 | SF | BA | NOFAC | DPM | 0.02 | 0.01 | 0.00 |
| TRU | 21 | SF | BA | NOFAC | NOX | 0.2 | 0.2 | 0.2 |
| TRU | 21 | SF | BA | NOFAC | ROG | 0.1 | 0.1 | 0.0 |
| TRU | 21 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 22 | MC | MPA | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRU | 22 | MC | MPA | NOFAC | NOX | 0.0 | 0.0 | 0.0 |
| TRU | 22 | MC | MPA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 22 | MC | MPA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 23 | NC | MEN | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| TRU | 23 | NC | MEN | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| TRU | 23 | NC | MEN | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRU | 23 | NC | MEN | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 24 | SJV | SJU | NOFAC | DPM | 0.02 | 0.01 | 0.00 |
| TRU | 24 | SJV | SJU | NOFAC | NOX | 0.2 | 0.2 | 0.2 |
| TRU | 24 | SJV | SJU | NOFAC | ROG | 0.1 | 0.1 | 0.0 |
| TRU | 24 | SJV | SJU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 25 | NEP | MOD | NOFAC | DPM | 0.00 | 0.00 | 0.00 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRU | 25 | NEP | MOD | NOFAC | NOX | 0.0 | 0.0 | 0.0 |
| TRU | 25 | NEP | MOD | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 25 | NEP | MOD | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 26 | GBV | GBU | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRU | 26 | GBV | GBU | NOFAC | NOX | 0.0 | 0.0 | 0.0 |
| TRU | 26 | GBV | GBU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 26 | GBV | GBU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 27 | NCC | MBU | NOFAC | DPM | 0.03 | 0.02 | 0.00 |
| TRU | 27 | NCC | MBU | NOFAC | NOX | 0.3 | 0.3 | 0.3 |
| TRU | 27 | NCC | MBU | NOFAC | ROG | 0.2 | 0.1 | 0.0 |
| TRU | 27 | NCC | MBU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 28 | SF | BA | NOFAC | DPM | 0.02 | 0.01 | 0.00 |
| TRU | 28 | SF | BA | NOFAC | NOX | 0.1 | 0.2 | 0.2 |
| TRU | 28 | SF | BA | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRU | 28 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 29 | MC | NSI | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| TRU | 29 | MC | NSI | NOFAC | NOX | 0.1 | 0.2 | 0.2 |
| TRU | 29 | MC | NSI | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRU | 29 | MC | NSI | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 30 | SC | SC | NOFAC | DPM | 0.17 | 0.11 | 0.01 |
| TRU | 30 | SC | SC | NOFAC | NOX | 1.5 | 1.8 | 1.9 |
| TRU | 30 | SC | SC | NOFAC | ROG | 0.9 | 0.5 | 0.3 |
| TRU | 30 | SC | SC | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 31 | LT | PLA | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRU | 31 | LT | PLA | NOFAC | NOX | 0.0 | 0.0 | 0.0 |
| TRU | 31 | LT | PLA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 31 | LT | PLA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 31 | MC | PLA | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRU | 31 | MC | PLA | NOFAC | NOX | 0.0 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRU | 31 | MC | PLA | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 31 | MC | PLA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 31 | SV | PLA | NOFAC | DPM | 0.02 | 0.02 | 0.00 |
| TRU | 31 | SV | PLA | NOFAC | NOX | 0.2 | 0.2 | 0.3 |
| TRU | 31 | SV | PLA | NOFAC | ROG | 0.1 | 0.1 | 0.0 |
| TRU | 31 | SV | PLA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 32 | MC | NSI | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRU | 32 | MC | NSI | NOFAC | NOX | 0.0 | 0.1 | 0.1 |
| TRU | 32 | MC | NSI | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 32 | MC | NSI | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 33 | MD | MOJ | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRU | 33 | MD | MOJ | NOFAC | NOX | 0.0 | 0.0 | 0.0 |
| TRU | 33 | MD | MOJ | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 33 | MD | MOJ | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 33 | MD | SC | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRU | 33 | MD | SC | NOFAC | NOX | 0.0 | 0.0 | 0.0 |
| TRU | 33 | MD | SC | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 33 | MD | SC | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 33 | SC | SC | NOFAC | DPM | 0.08 | 0.05 | 0.00 |
| TRU | 33 | SC | SC | NOFAC | NOX | 0.7 | 0.8 | 0.9 |
| TRU | 33 | SC | SC | NOFAC | ROG | 0.4 | 0.2 | 0.1 |
| TRU | 33 | SC | SC | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 33 | SS | SC | NOFAC | DPM | 0.02 | 0.01 | 0.00 |
| TRU | 33 | SS | SC | NOFAC | NOX | 0.2 | 0.2 | 0.2 |
| TRU | 33 | SS | SC | NOFAC | ROG | 0.1 | 0.1 | 0.0 |
| TRU | 33 | SS | SC | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 34 | SV | SAC | NOFAC | DPM | 0.11 | 0.07 | 0.01 |
| TRU | 34 | SV | SAC | NOFAC | NOX | 1.0 | 1.2 | 1.3 |
| TRU | 34 | SV | SAC | NOFAC | ROG | 0.6 | 0.3 | 0.2 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRU | 34 | SV | SAC | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 35 | NCC | MBU | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRU | 35 | NCC | MBU | NOFAC | NOX | 0.0 | 0.0 | 0.1 |
| TRU | 35 | NCC | MBU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 35 | NCC | MBU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 36 | MD | MOJ | NOFAC | DPM | 0.03 | 0.02 | 0.00 |
| TRU | 36 | MD | MOJ | NOFAC | NOX | 0.2 | 0.3 | 0.3 |
| TRU | 36 | MD | MOJ | NOFAC | ROG | 0.1 | 0.1 | 0.0 |
| TRU | 36 | MD | MOJ | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 36 | SC | SC | NOFAC | DPM | 0.10 | 0.07 | 0.01 |
| TRU | 36 | SC | SC | NOFAC | NOX | 0.9 | 1.1 | 1.2 |
| TRU | 36 | SC | SC | NOFAC | ROG | 0.5 | 0.3 | 0.2 |
| TRU | 36 | SC | SC | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 37 | SD | SD | NOFAC | DPM | 0.18 | 0.11 | 0.01 |
| TRU | 37 | SD | SD | NOFAC | NOX | 1.5 | 1.9 | 2.0 |
| TRU | 37 | SD | SD | NOFAC | ROG | 0.9 | 0.5 | 0.3 |
| TRU | 37 | SD | SD | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 38 | SF | BA | NOFAC | DPM | 0.05 | 0.03 | 0.00 |
| TRU | 38 | SF | BA | NOFAC | NOX | 0.4 | 0.5 | 0.5 |
| TRU | 38 | SF | BA | NOFAC | ROG | 0.2 | 0.1 | 0.1 |
| TRU | 38 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 39 | SJV | SJU | NOFAC | DPM | 0.06 | 0.04 | 0.00 |
| TRU | 39 | SJV | SJU | NOFAC | NOX | 0.5 | 0.6 | 0.6 |
| TRU | 39 | SJV | SJU | NOFAC | ROG | 0.3 | 0.2 | 0.1 |
| TRU | 39 | SJV | SJU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 40 | SCC | SLO | NOFAC | DPM | 0.03 | 0.02 | 0.00 |
| TRU | 40 | SCC | SLO | NOFAC | NOX | 0.3 | 0.3 | 0.3 |
| TRU | 40 | SCC | SLO | NOFAC | ROG | 0.1 | 0.1 | 0.0 |
| TRU | 40 | SCC | SLO | NOFAC | SOX | 0.0 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRU | 41 | SF | BA | NOFAC | DPM | 0.05 | 0.03 | 0.00 |
| TRU | 41 | SF | BA | NOFAC | NOX | 0.4 | 0.5 | 0.5 |
| TRU | 41 | SF | BA | NOFAC | ROG | 0.2 | 0.1 | 0.1 |
| TRU | 41 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 42 | SCC | SB | NOFAC | DPM | 0.04 | 0.02 | 0.00 |
| TRU | 42 | SCC | SB | NOFAC | NOX | 0.3 | 0.4 | 0.4 |
| TRU | 42 | SCC | SB | NOFAC | ROG | 0.2 | 0.1 | 0.1 |
| TRU | 42 | SCC | SB | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 43 | SF | BA | NOFAC | DPM | 0.12 | 0.07 | 0.01 |
| TRU | 43 | SF | BA | NOFAC | NOX | 1.0 | 1.2 | 1.3 |
| TRU | 43 | SF | BA | NOFAC | ROG | 0.6 | 0.3 | 0.2 |
| TRU | 43 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 44 | NCC | MBU | NOFAC | DPM | 0.02 | 0.01 | 0.00 |
| TRU | 44 | NCC | MBU | NOFAC | NOX | 0.2 | 0.2 | 0.2 |
| TRU | 44 | NCC | MBU | NOFAC | ROG | 0.1 | 0.1 | 0.0 |
| TRU | 44 | NCC | MBU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 45 | SV | SHA | NOFAC | DPM | 0.03 | 0.02 | 0.00 |
| TRU | 45 | SV | SHA | NOFAC | NOX | 0.3 | 0.3 | 0.3 |
| TRU | 45 | SV | SHA | NOFAC | ROG | 0.2 | 0.1 | 0.0 |
| TRU | 45 | SV | SHA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 46 | MC | NSI | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRU | 46 | MC | NSI | NOFAC | NOX | 0.0 | 0.0 | 0.0 |
| TRU | 46 | MC | NSI | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 46 | MC | NSI | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 47 | NEP | SIS | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| TRU | 47 | NEP | SIS | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| TRU | 47 | NEP | SIS | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRU | 47 | NEP | SIS | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 48 | SF | BA | NOFAC | DPM | 0.02 | 0.01 | 0.00 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRU | 48 | SF | BA | NOFAC | NOX | 0.2 | 0.2 | 0.2 |
| TRU | 48 | SF | BA | NOFAC | ROG | 0.1 | 0.1 | 0.0 |
| TRU | 48 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 48 | SV | YS | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| TRU | 48 | SV | YS | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| TRU | 48 | SV | YS | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 48 | SV | YS | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 49 | NC | NS | NOFAC | DPM | 0.01 | 0.00 | 0.00 |
| TRU | 49 | NC | NS | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| TRU | 49 | NC | NS | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 49 | NC | NS | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 49 | SF | BA | NOFAC | DPM | 0.04 | 0.03 | 0.00 |
| TRU | 49 | SF | BA | NOFAC | NOX | 0.3 | 0.4 | 0.4 |
| TRU | 49 | SF | BA | NOFAC | ROG | 0.2 | 0.1 | 0.1 |
| TRU | 49 | SF | BA | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 50 | SJV | SJU | NOFAC | DPM | 0.05 | 0.03 | 0.00 |
| TRU | 50 | SJV | SJU | NOFAC | NOX | 0.4 | 0.5 | 0.6 |
| TRU | 50 | SJV | SJU | NOFAC | ROG | 0.3 | 0.1 | 0.1 |
| TRU | 50 | SJV | SJU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 51 | SV | FR | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| TRU | 51 | SV | FR | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| TRU | 51 | SV | FR | NOFAC | ROG | 0.1 | 0.0 | 0.0 |
| TRU | 51 | SV | FR | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 52 | SV | TEH | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| TRU | 52 | SV | TEH | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| TRU | 52 | SV | TEH | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 52 | SV | TEH | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 53 | NC | NCU | NOFAC | DPM | 0.00 | 0.00 | 0.00 |
| TRU | 53 | NC | NCU | NOFAC | NOX | 0.0 | 0.0 | 0.0 |

| TYPE | County | AB | DIS | FACTYP | POL | 2001 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| TRU | 53 | NC | NCU | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 53 | NC | NCU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 54 | SJV | SJU | NOFAC | DPM | 0.04 | 0.03 | 0.00 |
| TRU | 54 | SJV | SJU | NOFAC | NOX | 0.3 | 0.4 | 0.4 |
| TRU | 54 | SJV | SJU | NOFAC | ROG | 0.2 | 0.1 | 0.1 |
| TRU | 54 | SJV | SJU | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 55 | MC | TUO | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| TRU | 55 | MC | TUO | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| TRU | 55 | MC | TUO | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 55 | MC | TUO | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 56 | SCC | VEN | NOFAC | DPM | 0.06 | 0.04 | 0.00 |
| TRU | 56 | SCC | VEN | NOFAC | NOX | 0.5 | 0.6 | 0.7 |
| TRU | 56 | SCC | VEN | NOFAC | ROG | 0.3 | 0.2 | 0.1 |
| TRU | 56 | SCC | VEN | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 57 | SV | YS | NOFAC | DPM | 0.02 | 0.01 | 0.00 |
| TRU | 57 | SV | YS | NOFAC | NOX | 0.2 | 0.2 | 0.2 |
| TRU | 57 | SV | YS | NOFAC | ROG | 0.1 | 0.1 | 0.0 |
| TRU | 57 | SV | YS | NOFAC | SOX | 0.0 | 0.0 | 0.0 |
| TRU | 58 | SV | FR | NOFAC | DPM | 0.01 | 0.01 | 0.00 |
| TRU | 58 | SV | FR | NOFAC | NOX | 0.1 | 0.1 | 0.1 |
| TRU | 58 | SV | FR | NOFAC | ROG | 0.0 | 0.0 | 0.0 |
| TRU | 58 | SV | FR | NOFAC | SOX | 0.0 | 0.0 | 0.0 |

**PEER REVIEW AND RESPONSE TO COMMENTS**

The emissions inventory developed to support the Draft Goods Movement Plan released in December was sent to Dr. Robert Harley of the UC Berkeley Department of Civil and Environmental Engineering, and Dr. James Corbett of the University of Delaware Graduate College of Marine Studies for peer review. Both reviewers were asked to answer the following questions:

1. What is your overall opinion of the assessment?
2. Is there sufficient documentation and transparency of the methodology and results?
3. Have the caveats, uncertainties, and limitations of the methods and results been fully acknowledged?
4. Have any mistakes or misleading statements been made?
5. Do you have any suggestions for additional sources, pollutants, databases, methods, calculations, health endpoints, etc. that should be included over the short-term (next 1-2 months)?
6. Do you have suggestions for any issues that should be investigated over the long-term (several months to years)?

Comments provided by peer-reviewers pertain to the emissions inventory developed to support the Draft goods movement plan in December. As described above, since December staff have substantially updated, and changed the scope, of the goods movement inventory. Some comments were addressed as part of this update while others were not. Our responses to comments are summarized below:

| Reviewer | No. | Comment | Response |
|---|---|---|---|
| Harley | 1 | There are errors in Table 6: NOx should be much more abundant than ROG in diesel locomotive emissions. A likely explanation is that the column headings for ROG and NOx are reversed. I compared the values in Table 6 to ARB's current statewide inventory for locomotives as of 2004 (PM = 5, ROG = 9, NOx = 177, and $SO_2$ = 17 tons/day). | The reviewer is correct and the error has been corrected. |
| Harley | 2 | The proportion of the state total locomotive emissions assigned to international goods movement is ~40% for all pollutants except $SO_2$ which is 16%. The ~40% contribution seems high given that the fraction of rail travel associated with international goods movement is assumed to be 40% in the SoCAB and 25% elsewhere. Why is the $SO_2$ relative contribution for international goods movement by rail so much lower than for the other pollutants? | The locomotive emissions inventory has been revised in the current Proposed plan. For 2005, the relative contribution of emissions from switching and intermodal line haul trains assigned to the international category ranges from 27% to 35%. |
| Harley | 3 | In Table 32, there is excessive/unwarranted precision (8 | The reviewer is correct and the table has been updated. |

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| | | significant figures) in the emissions values that are tabulated for 2001, 2010, and 2020. | |
| Harley | 4 | To improve transparency of the results shown in the report, it would be helpful to add a tabulation of the average emission factors (g/kWh) used in calculating emissions from each major category relating to goods movement (ocean-going ships, in-harbor craft, cargo handling equipment, locomotives, on-road trucks, etc.). I recommend presentation of emission factors for PM, ROG, NOx, SO2, and also brake specific fuel consumption (bsfc) to allow for calculation of greenhouse gas emissions if desired as part of follow-on work. | This comment has merit and makes sense. Based on time constraints we have not yet been able to add data as requested. |
| Harley | 5 | In future surveys of ports to determine cargo handling equipment hours of use, engine population, etc., I recommend that diesel fuel usage (total gallons per year) also be asked as a survey question. At present it appears that uncertain and somewhat arbitrary load factors are being used to calculate total engine work done per year in kWh units. Knowing "in-house" fuel usage by ports would allow for checks of the engine activity part of the emission inventory calculations. | We agree that load factors used to support cargo handling equipment emissions estimates specifically, and offroad emissions estimates more generally are uncertain. We are investigating ways of improving our estimates and the reviewer's comment is noted. |
| Harley | 6 | There are uncertainties in the predictions of the EMFAC model for HD trucks, specifically with respect to activity (diesel truck travel is not represented in current travel demand models), different spatial and temporal patterns of truck vs. passenger vehicle travel, faster rate of growth vs. passenger vehicle travel (see Harley et al., *Environ. Sci. Technol.* **39**, 5356-5362, 2005), higher in-use $NO_x$ emissions versus certification standards, and $NO_x$ emission benefits of reformulated diesel fuel (somehow this has doubled from ~5% in published studies to a 10% benefit coded into | Heavy-duty diesel truck emissions estimates are uncertain, but are based upon the best information available to ARB. The truck inventory in the current Proposed plan is substantially different from estimates in EMFAC 2002, and reflect new estimates of emission factors and activity that reflect new data available to ARB. |

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| | | EMFAC for $NO_x$). These uncertainties should be acknowledged. On-road exhaust PM emission rates appear to be decreasing in contrast to NOx which is changing very slowly if at all. | |
| Harley | 7 | A statewide assessment of on-road and off-road diesel engine activity and emissions is recommended, to help place the results of the present study in context. I am concerned that on-road diesel NOx is too low for reasons outlined above, whereas some off-road emissions may be overstated (see Kean et al., *J. A&WMA* **50**, 1929-1939, 2000) due to uncertainties in engine activity. | Comment noted. |
| Harley | 8 | At present the EMFAC and OFFROAD emission models are decoupled – a needed top-down check is whether the total on+off-road engine activity corresponds to the amount of diesel fuel supplied in California. This is recommended as a longer-term research issue. | Comment noted. |
| Corbett | 1 | I like the methodology discussion, and think you did a fairly comprehensive job in your estimates. As such, most of my comments may appear editorial/technical, rather than fundamental. | Comment noted. |
| Corbett | 2 | I think Appendix D would benefit from better clarity as commented below. | Comment noted. |
| Corbett | 3 | I support the comments of Rob Harley. | Comment noted. |
| Corbett | 4 | Estimation of emissions from international goods movement was NOT primarily from EMFAC and OFFROAD, and emissions estimation methodologies for ships and trains are fundamentally similar to these models. The allocation of EMFAC and OFFROAD activity to international goods movement is done exogenous to these models, and is critical to your results. I think you did a good job, but your introduction leads one to mistakenly think you actually used EMFAC and OFFROAD for most | Language regarding use of EMFAC and OFFROAD has been revised. The 24 nautical mile boundary was chosen to be consistent with ARB's recently passed auxiliary engine ATCM for ocean-going vessels. This notation has been added to Chapter Two and this technical supplement. We have attempted to clarify the |

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| | | of this analysis.<br>Estimates of emissions out to 24 nautical miles is good, but not well explained – especially in terms of results. You should explain the rationale behind the 24 mile region (why not 100 miles, or 3 miles?); this is vaguely alluded to on page D-2 (bottom), but not until three paragraphs after you first introduce the 24 mile extent. Also, your results should more clearly differentiate among those emissions near shore and those farther out, especially for PM and other distance-sensitive emissions. Exposure should decrease with distance from land, unless the pollutant is an ozone precursor or otherwise reactive (sulfate?); without going into all that, your results should be differentiated by distance from shore in the pie charts (for OGVs at least). Open ocean versus at sea versus continental shelf are not identical but seem to be used interchangeably. The delineation should be clearer; Figure 7 is not enough, and comes with its own comments (below). | discussion regarding off-shore vs. on-shore, but this is one of those areas where our changes have been time-limited. |
| Corbett | 5 | How do we know what you left in and left out of your OGV inventory? Text says, *"ARB considers an ocean-going ship if the vessel is greater than or equal to 400 feet in length or 10,000 gross tons; or propelled by a marine compression ignition engine with a displacement of greater than or equal to 30 liters per cylinder."* These are overlapping definitions, and could exclude small cargo vessels (very few!). You may have some rationale for not including all vessels below 10,000 gross tons, unless they were >400 feet long or had larger engines, but you don't explain it. (Did the State Lands data not include it? Did you capture +99% of all data in the State Lands source?) | Between our ocean-going ship and commercial harbor craft inventories we believe we have covered all commercial vessels operating off the coast of California. Vessels, such as small cargo vessels which may not be captured by the ocean-going ship category are captured under the "other" category of commercial harbor craft. Our inventory captures more than 99% of California's State Land Commission data in the ocean-going ship inventory, with the exception of tug boats that are covered in the commercial harbor craft inventory. |

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| Corbett | 6 | Generally, your emissions probably assume compounds of $SO_2$ (for SOx), $NO_2$ (for NOx), etc., but you don't clearly tell the reader whether you are using elemental weights or compound species weights. Simple clarity comment, but it is important generally to have this report in a form that atmospheric scientists can use as well as ARB's primary audience. | Mass emissions are based upon SO2, which is assumed representative of total SOx, and total NOx. |
| Corbett | 7 | Page D-1, Methodology: Text says, *"In California, these mobile source inventories are estimated primarily by two mathematical modeling tools: EMFAC for on-road sources such as heavy duty trucks, and OFFROAD for off-road sources such as cargo handling equipment. Emissions for ships and locomotives are calculated using inventory development methodologies that are similar to but separate from these two models."* However, most emissions appear to come from ships and trains in all categories (except perhaps ROG at 50% of total), using Figure 5 for 2001; even more would be from that if we used 2020 or other future forecast. I would not claim that primary calculations came from EMFAC and OFFROAD, given these results. | We have revised the text to reflect this comment. |
| Corbett | 8 | Page D-3, bottom paragraph: This is a well-written summary of general characteristics of the fleet, but it reads like an absolute description rather than a general one, at least until the third-from-last sentence on cruise ships. For most sentences, one could take issue: not all engines are internal combustion, compression-ignition; there may be more than one main engine. More importantly, I cannot tell if you are repeating world fleet characteristics or specific characteristics derived from your State Lands data – a subset where these may have fewer exceptions than for the world fleet overall. | Ships have both internal and external combustion engines; our ocean-going ship inventory now includes emissions from external as well as internal combustion sources, such as boilers on ships. Our inventory reflects State Lands data, as well as information provided by the Ports of Los Angeles and Long Beach. |
| Corbett | 9 | Page D-4: Text reads, "*2004 California State Lands Commission vessel visits data was used as the primary source of vessel population information.*" You don't really describe this data set (not publicly available?), and you should. How | We have updated our discussion to describe the State Lands database used to support the ocean-going ship inventory. The definition of ocean-going ships provided in |

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| | | similar is it to other data sets? How many port calls does it document statewide in a year? Was 2004 a typical year or not? Is there any other data quality properties that can help define its pedigree? How many vessel visits fell into each of your bounding conditions: a) how many <10,000 gross tons; b) how many visits from ships <400 feet long; c) how many vessels main engines <30 liters/cylinder? Why should the reader believe this data is complete? | this document as well as the Auxiliary engine rule was designed for regulatory definition. We used more than 99% of vessel visit information from the State Lands database, with the exception of tugboats, which are covered in the harbor craft category. |
| Corbett | 10 | Page D-5, Activity subsection: Should you identify the speed as rated or as actual or as estimated in-service? Later on page D-5 you say that you used 80% power for at-sea conditions; why does this correlate to rated speed or does it correlate to estimated service speed? Which speeds from Starcrest did you take to match to the at-sea load assumptions? This needs to be clearer. Also, maneuvering times for the Starcrest study (San Pedro Bay) are not appropriate for Central Valley ports (Sacramento, Stockton), as an extreme example, and may be inappropriate for Oakland and other SF Bay ports. Can you clarify if your common assumption that "maneuvering times from the Starcrest report were … representative for all ports statewide" is likely overestimating these other ports, or did you make adjustments? | The speed used for emissions calculations refer to the average Lloyd's maximum speed value for the vessel type and size range. The 80% load factor was selected because it is the most likely load factor for ships at normal service speed. As mentioned in the document, where port-specific maneuvering times were available (for example Port Hueneme) they were used. It is likely that maneuvering times are underestimated for other ports in Northern California, particularly the inland ports; as improved maneuvering times become available they will be used. |
| Corbett | 11 | Page D-6, Import/Export Allocation: Did you divide unique transits according to these import/export ratios? This is likely wrong, since ships coming in with imports may also be carrying the exports on a voyage they would have made anyway. Therefore, you could be under-assigning emissions to importing shipping and over-attributing emissions to ships you may consider only exporting cargoes (i.e., coming empty to get our exports). This could be an okay first cut, but it may be a weak assumption that is criticized later; you may want to acknowledge this or | Import-export allocations were made for ocean-going ships as a whole and were not done on a transit by transit basis. At any rate, the separation of import vs. export was not ultimately used in the inventory for port-related sources including ships and harbor craft. All ship and harbor craft emissions were included in both the international and all goods movement inventories. |

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| | | otherwise document how good you believe these assumptions to be. For example, you may not want to project growth in export traffic, assuming that higher growth rates in import traffic will accommodate any export growth with available backhaul capacity. | |
| Corbett | 12 | Page D-7, Commercial Harbor Craft, Population: There is potential error when using only CA-registered vessels in the USCG database. Unlike automobiles, vessels in the USCG database can be registered in one state and perform commercial service in another state. This is more like commercial long-haul trucking, where you see trailers and trucks with plates from other states. (Service outside the state of registry may be more common for recreational vessels than for commercial vessels.) I cannot tell if your efforts considered this, or determined that it doesn't really apply to these vessels. I don't think you can do much to fix the error, and as long as you are clear in your assumption that may be enough for now. | We do acknowledge that using the US Coast Guard data for California registered vessels may miss activity associated with harbor craft that are registered outside of California but operate off the coast of California. We are currently in the process of developing an updated harbor craft inventory, which we expect to complete towards the end of this year. |
| Corbett | 13 | Page D-7, Table 4 (and other tables): When you present emissions estimates for these vessels, you may want to also indicate the numbers of vessels (and/or installed power) by vessel type. Without this, your emissions totals are sort of "black-box" and cannot be independently reviewed at all. I don't think you will need to reveal any confidential data, but you could present better summary data for the vessels in each grouping. | In the harbor craft section of this document we reference an additional report on harbor craft baseline inventory development. As stated above, we are still updating the category and expect to generate an improved inventory as well as documentation later this year. |
| Corbett | 14 | Page D-8, Import/Export Allocation (and Table 4): I am not sure that you should be allocating all activity from the vessels in Table 4 ("*except those from fishing boats and passenger ferries*") to international goods movements. Crew and supply, Others, and Work Boats (at least) are often in domestic service, I think. Pilot | The statement referenced by Dr. Corbett in this comment from Table 4 was misstated. In fact, we have always included all harbor craft emissions in the international category because we have defined the international |

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| | | and Tow Boats are probably allocated to both domestic and international ship arrivals, and the domestic shipments of petroleum from Alaska to California may not be negligible. Again, this could be a good first effort, but some of these assumptions appear weak without justification. | category as including all port-related emissions and international truck and locomotive emissions. Import export splits, while applied to the inventory, were not used to support plan development. |
| Corbett | 15 | Page D-10, bottom: You say, "*The estimated growth rates in cargo handling equipment populations and activity varied by equipment type.*" What did this reveal? Do some types of equipment grow faster than others and do some seem to be phasing out (declining)? You may want to be clearer here. | Discussion on estimated growth in the cargo handling equipment category is available at: http://www.arb.ca.gov/regact/cargo2005/appb.pdf |
| Corbett | 16 | Page D-16, Table 11 (and at least Table 13): What does it mean that the fraction of VMT attributed to international goods trucking movements is increasing from 0.16 in 2001 to 0.33 in 2025? Does it imply a decline in domestic trucking or a modal shift to more trucking from rail and water? Or something else – perhaps VMT for all trucking compared to VMT for cars? Why doesn't all trucking VMT grow, keeping the relative fraction of international goods movement about the same? What declines as this fraction increases? | In the December plan we used a relatively crude methodology for estimating truck emissions associated with international goods movement. This approach has been substantially improved and is described both in Chapter 2 and this document. |
| Corbett | 17 | Page D-20: Where it says, "*Over the next several decades, the amount of goods imported into or moved through California is projected to increase dramatically*", you should be more quantitative. Specifically, you should make explicit the relationship between cargo growth and emissions growth, acknowledge that different rates may apply, but that you (we) assume a similarity in the underlying growth functions. This helps relate the work done, then energy required, and the emissions resulting from goods movement. It will also help me understand if my project uses similar cargo growth data or not, and whether EPA's pending SECA analysis will be similar. | We revised both Chapter 2 and this document to reflect this request. |
| Corbett | 18 | Page D-21, Figure 1: Several nearly | Figures have been updated. |

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| | | editorial comments, but they are technically important. First, the numbers in this table appear to be different from the 3-D bar chart in Figure 2. For example, I think the 2001 SOx number in Figure 1 (65 tons per day) is greater than the 2001 SOx number in Figure 2 (appears less than 50 tpd). 3-D distortion or data error? | |
| Corbett | 19 | Pages D-21, D-25, and D-27, Figures 1, 5, 7: I would like to see the pie charts (especially for OGV ships, but perhaps for harbor craft as appropriate) split into the fractions at sea and fractions not at sea (what is not at sea: other than open ocean, inside continental shelf, near port, in port, at dock?). You do this in Figure 7, but it looks like a very large percent of the emissions attributed to ships would have to be transported some distance before exposing Californians. It would be most important for PM and other non-reactive, less long-range species, but someone could criticize your report for implying that all these emissions are "in-state" when some are not. Again (see above), the rationale for 24 nautical miles and what you count as at-sea is important; do you consider everything outside 3 miles to be at sea? What counts as open ocean (page D-24), and is this the same as at sea? | This is an area where if we had more time we would more thoroughly respond to this request. We count emissions outside of three miles from shore out to 24 nautical miles for this plan to be at sea. In this report, we use the terms at sea and open ocean loosely; both reflect emissions released from 3 – 24 nautical miles. |
| Corbett | 20 | Page D-27, Figure 7: You don't explain whether/why this figure leaves out or considers a SECA scenario in the forecasted years. You don't mention SECA at all (okay, perhaps), but don't clearly identify that you are forecasting uncontrolled ship emissions versus expected reductions in other modes contributing to these fractions at sea. Does a SECA explain the rather flat SOx percents at sea, or is this due to the very low sulfur fuels in other modes and cargo equipment? Why do the trends for NOx, PM, and ROG all follow the same general pattern, and SOx | SECA scenarios are not considered as part of the baseline inventory, and are instead considered as an emission reduction strategy in the Goods Movement Emissions Reduction Plan. |

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| | | doesn't? | |
| Corbett | 21 | Page D-1: um should be µm. | Comment noted. |
| Corbett | 22 | Page D-3, Table 1 (and others): Last row of table is confusingly labeled as "Total Ships" when it really is "Total emissions from all ships". | Comment noted. |
| Corbett | 23 | Page D-8: Is OFFROAD different from NONROAD? You refer to these models, but it may be that only OFFROAD is used for these data. | OFFROAD is the only model used in California to estimate emissions from off-road equipment. |
| Corbett | 24 | Page D-9: You should cite a source for this sentence: "*There are approximately 3,700 pieces of cargo handling equipment vehicles at California's ports and intermodal rail yards.*" | A more detailed discussion of this statement is available at: http://www.arb.ca.gov/regact/cargo2005/appb.pdf |
| Corbett | 25 | Page D-13, bottom: You may want to add the word "international" to the sentence that would then read, "Our approach in developing an goods movement heavy duty truck inventory was to estimate a portion of emissions in EMFAC associated with ***international*** goods movement, and to supplement these data with facility-specific emissions estimates for ports and rail yards in California." | Comment noted. |
| Corbett | 26 | Page D-14, *SoCAB*: Not spelled out anywhere. | South Coast Air Basin. Comment noted. |
| Corbett | 27 | Page D-14 and elsewhere (including Table 11): Truck types T1 through T7 or so are never clearly defined. Also, an extra space is in the sentence with these labels, where it says "…; staff assumed goods in the T7…." | The truck inventory has been substantially revised and discussion added to the text. |
| Corbett | 28 | Page D-20: Where it says, "*representing about 10%of the total statewide NOx emissions inventory*", there ought to be a space after %. | Comment noted. |
| Corbett | 29 | Page D-20, bottom: Where it says, "*Taken together, ocean-going ships and harbor craft account for 65 percent of* | Comment noted. |

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| | | *the diesel particulate goods movement inventory; the majority of these emissions are generated over the open ocean*", you should reference figure 7. Also, at the bottom, the word Ports should not be capitalized as part of the names. | |
| Corbett | 30 | Page D-22, Figure 2: Since the numbers cannot be read directly from this figure, due to the 3-D presentation, something must be done. You can also add a table, redundant but clear; you can label each bar with the value; you can turn it into a 2-D presentation (lines? Or bars?). I would probably do the table alongside the figure. That could correct Specific Comment 12, above. This may apply to the other 3-D figures too (see especially, figure 4). | Comment noted. |
| Corbett | 31 | Page D-22, paragraph below Figure 2: Seems out of place, given the later section on the LA region, and given that the next paragraph switches back to the whole state discussion. | Comment noted. |

## REFERENCES


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